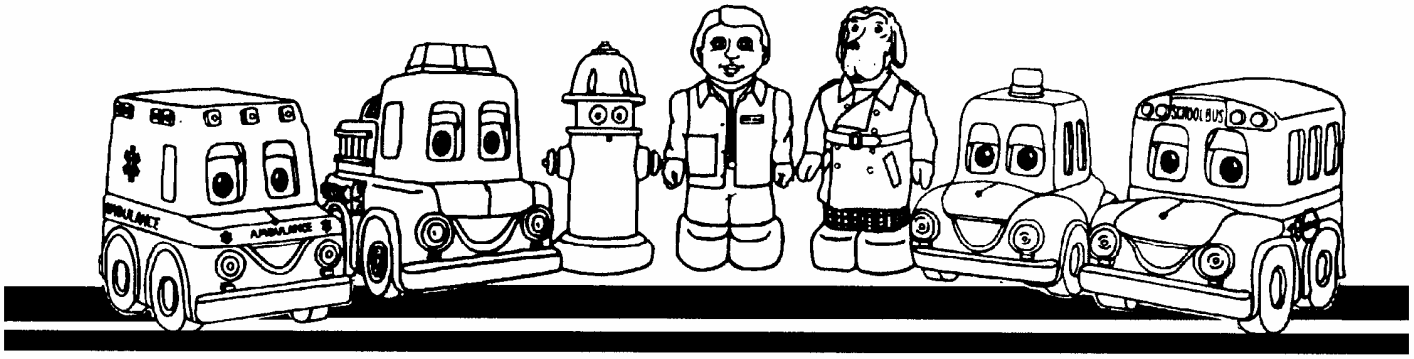


Robotronics®

The Leader In Safety Education Products

1610 West 1600 South Springville, UT 84663
Phone: 801-489-4466 FAX: 801-489-8241

Pluggie Robot Operating Manual

Version 1 (1983-1989)

Pluggie Robot Operating Manual

Congratulations on your purchase of a ROBOTRONICS, Inc. robot. Your robot has been carefully constructed of the highest quality components. Its design is the result of years of experience building robots. You will find it an extremely effective spokesman for your organization. It is built for ease of operation, maintenance and repair. It is built so that you can easily expand its functions making its usefulness grow as your needs grow.

Please read this manual carefully. It will help you make the most of your robot. Attention to maintenance and proper training will greatly prolong the life of your robot. Most problems you encounter will be minor and the manual will provide an answer. Please feel free to contact us if you have unanswered questions relating to operation, maintenance, and repair. Also, if you have technical questions relating to expanding the functions of your robot, we would be most happy to help.

Sincerely,

ROBOTRONICS, Inc.

Contents

Appendixes

* These sections can be used to place additional notes that you would like to record, during your use of the robot.

Limited Warranty

All robots and accessories have a limited 6 month warranty, which covers all parts and labor. This period covers the normal burn-in for electronic components. Experience has shown that this warranty period catches most component defects and other possible flaws. If you have a problem, we are anxious to help. Our desire is to be certain you receive a quality product and excellent service.

Warranty work is specifically limited to correction of defects by repair or replacement of faulty equipment or parts. The robot shall be repaired or replaced at Seller's option. Equipment returned to the factory for repair must have pre-authorization from our service department and must be sent freight pre-paid, and will be returned freight pre-paid by UPS ground or common carrier. If you need parts sent by air shipment you will be responsible to pay the additional shipping charges.

In no event shall ROBOTRONICS, Inc. be liable for any incidental or consequential damages in connection with or arising from the use of the robot.

The buyer is further responsible to ensure that proper and complete training be given to those operating the robot system as all aspects of such operation cannot be covered in a brief manual such as this.

In no event shall ROBOTRONICS, Inc. be liable for any incidental or consequential damages in connection with or arising from the use of this manual or any procedures contained herein.

If You Have A Problem

- Call our service department and explain the problem. The phone number is (801) 489-4466. Most difficulties are minor and can be solved easily over the phone. If possible, have the robot near the phone when you call.

Important: Have the robot serial number and model number ready. This will help our technician identify the model of robot you have. The serial and model number sticker is located on the robot frame on the right side. In the Appendix, the Lower Robot - Top View shows the location of the serial number sticker.

- If you must return a part or the robot for repair, pack it carefully and send it prepaid according to instructions. You must obtain a return authorization number from the service department before shipping the robot or a part to the factory.

- Parts of the robot are best sent by a carrier such as UPS, Fed. Ex. or U.S. mail, because shipping is based on the actual weight of the package. Be sure to insure the shipment for the correct value. A freight company such as Roadway should be used only for the complete robot, because their shipping charges are based on 100 pound minimums.

- For international shipments, you will be responsible for paying customs duties, taxes and other fees. The shipment must be labeled on the paperwork and on the outside of the container that it is **"For Educational Purposes"**. If it is a **"warranty replacement"** or a **"repair return"** this also must be indicated both ways on the customs documentation.

Contact your customs agency on how to document the shipment correctly to avoid unnecessary customs charges.

After The Warranty Repair and Help

Our technical staff is always available to help with your questions. Again, most problems are easily solved. The robot is design is very modular to make removal of a part of the robot very easy. For example the main electronics box, which houses most of the electronic circuitry, can be removed from the frame of the robot. If you do need technical help or replacement parts, call our Service Dept. We can usually ship them the following day you call. Please call our service department for a return authorization number before sending a part or your robot in for repair or modifications.

Part 1 General Operating Instructions

CHAPTER 1 **Getting Started**

OPERATING HINTS

ROBOTRONICS, Inc. robots are a unique and exciting tool in the hands of a skilled and trained operator. The operator provides much of the excitement the robot conveys. The selection and training of the operator should be done carefully, so as to provide a person with good judgment and an outgoing personality. The operator is the single most important feature that the robot has. Nevertheless, with a little practice anyone can learn to operate the robot and even those with a shy personality can be very effective using the robot. The following points will help in your operation of the robot.

- Operate the robot with charged batteries in the transmitter and robot.
- Never operate the robot out of line-of-sight.
- When operating in crowds, always have a trained person posted near the robot to help in crowd control, and to protect the robot from vandalism. This person is also available to answer questions and interact with the robot.
- Operating distance should never exceed 100 feet. When moving the robot through crowds, the robot should be operated slowly and smoothly without any sudden changes of direction. Walls, turns, and other obstacles are hazards to be avoided. Safe clearance should be maintained between these obstacles and the robot.
- Never leave the robot "ON" when unattended or in direct sunlight for extended periods of time.
- The robot is designed to be operated on hard, smooth surfaces and carpet. Avoid extra deep shag carpet, dirt, gravel, or grass surfaces. Avoid steep inclines or large uneven surfaces such as curbs, gutters, or uncovered electrical lines.
- When using the robot on a stage, the area just in front of the stage should be clear of children for about 10 feet.
- When attempting to operate the robot for the first time, do so in a large flat area without obstacles. The operation of the controls should be done in a smooth, fluid manner. Avoid jerking starts and stops or overreacting to the controls. When first practicing movement, it is sometimes helpful to follow behind the robot, as robot movement will match stick movement. (Controls respond opposite when the robot is facing the operator.)

The robot can be a highly successful tool for education and entertainment. Appropriate jokes, stories and general conversation can be very effective. Children of all ages are strongly attracted to the robot. They will talk to it, hug it, kiss it, and generally treat it as a good friend. The smaller sized robots are very effective with children. They are light in weight and just the right size to communicate with children. The most important ingredient to the use and effective operation of the robot is common sense. The following instructions will help you get set up and start using the robot.

SETUP AND HOW TO OPERATE THE ROBOT

Step # 1
Read and study this manual completely before operating the robot.

Step # 2 Install and charge the batteries
To put the robot battery in the robot, tip the robot slightly to access the wing nut on the battery door. This is located on the bottom back of the robot. After removing the wing nut, open the door and lay the battery on the door with the battery wire harness running from left to right. Attach the Battery connector (square black and red), to the robot connector (also square black and red). Match red to red and black to black and connect them.

Note: The battery connector and robot connector look identical but they do connect together.

The battery door can now be closed and the wing nut put back on.
Be certain that the robot battery and radio control transmitter battery are fully charged before operating the robot. Plug the RC battery charger into the side of the radio control and the charging light will come on. The Pluggie battery can be charged in the robot or out. See the chapter on Pluggie battery charging.

Step # 3 Powering up
Turn the Radio Control Transmitter "ON" first and then turn the robot "ON". Check that the Radio Control Transmitter battery level meter reads to the right. The "ON/OFF" switch for the robot is located on the bottom left of the robot if you are standing behind the robot. Push the switch forward to turn the robot on (On/Off positions are labeled). The back position of the switch is the charging position.

Step # 4 Set the Volumes
Check that the volume of the voice and tape player are at the level that your want. The tape player volume can be changed on the tape player itself, which can be accessed under the cap. To remove the cap just grasp the bottom of the cap with your hands and give a short pull up. The cap will pop off. The volume for voice is on the 331-voice receiver which you need to remove the body to get to. If you want to remove the body there are instructions under the cap for how to do this.

Step # 5 Test all the functions
Test all of the robot's functions: voice both ways, cap, eyelids, eyes, tape, siren, and drive movement for proper operation. The robot is now ready to operate.

Step # 6 Optional Accessories Setup
For information about these, see the optional accessories section. This includes options such as the voice modifier and water squirter. These sections will give you step by step instructions for setup and related diagrams.

Step # 7 Powering Down
To turn off the system, turn the main switch to the “OFF” position. Finally turn off the Voice Transmitter, Receiver and the Radio Control Transmitter.

Step # 8 Charge the batteries again

Connect the Robot battery to the charger and bring it back to a full charge before leaving the robot. This battery should not be left with a partial charge. The transmitter battery should be charged if it is low.

- **All of the major functions of the robot each have a section in the manual with more details and diagrams. Refer to these for more in depth information. The Appendix has pictures and diagrams of where various parts are in the robot. These will help you become familiar with where the parts are located and their function.**

TRANSPORTING THE ROBOT

The vehicle that you use to transport the robot should have adequate shock absorption. Vans and cars used for passengers would be the best. Transporting the robot in a trailer is not recommended because trailers typically do not have the same level of shock absorption as a car or van. A good rule of thumb to follow is that if the vehicle is adequate for transporting a computer it should also be fine for the robot.

Double check that the body latches are secure. These two latch pins are found under the cap. They push into the body latch blocks. The cap nut on the top of the cap rod should be tight also.

Before strapping the robot to the cart, always put the robot cover on first. The robot cover protects the body from getting scratches, keeps UV light off it, and helps the keep the cap on during transport. Lift the robot on to the cart and place the wheels in the recess of the plastic platform. Run the bunji cord around the robot enough times to hold it on tight.

You can leave the robot on the transport cart while the robot is in transit, to keep the robot from rolling around.

⚠ CAUTION

If the robot is being transported in an open truck, the robot cover should be over the robot and tied down tight around the bottom to prevent the cap from getting blown off. If you do not have a cover you could take the cap off and put in the cab.

Part 2 Subsystems of the Robot

Functionally, the robot is made up of the following basic subsystems:

A. Radio Control System

B. Voice System

C. Cassette Tape Player

D. Siren

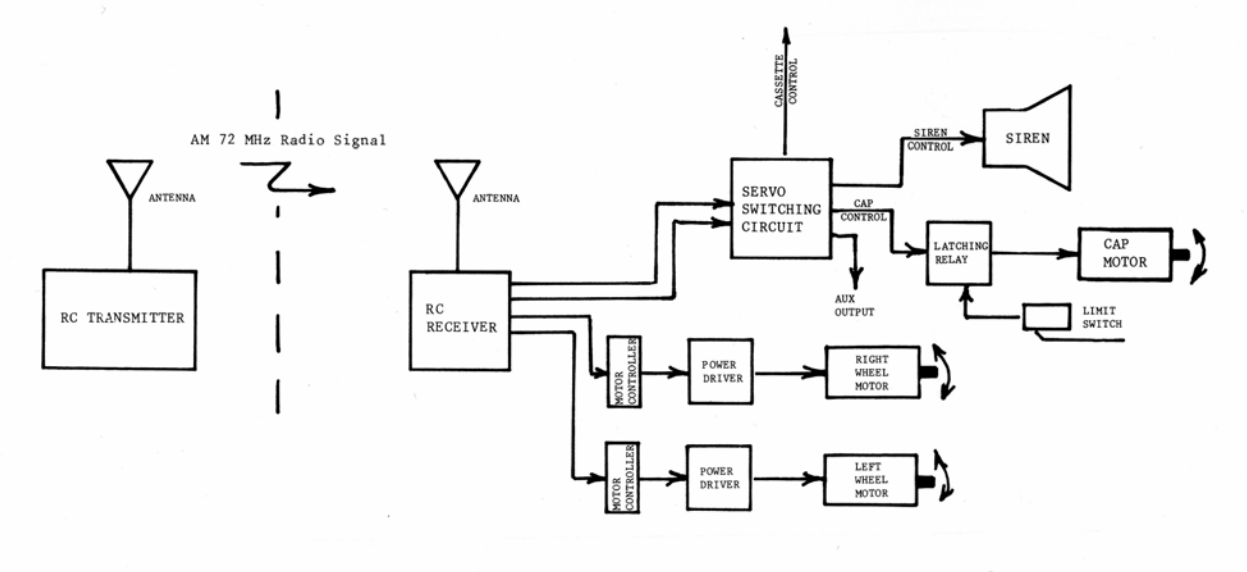
E. Robot Battery Systems

F. Drive Motors

G. Eyelids and Eyes Left and Right

The systems block diagram found in the Appendix shows how the various subsystems and their components are interrelated.

Following are explanations of each subsystem, some operating instructions, and trouble shooting hints where appropriate.



CHAPTER 2 **Radio Control System**

The Radio Control System consists of the control transmitter unit held by the operator and the receiver with its associated components in the robot.

The Radio Control Transmitter converts movements of the control sticks and switches into a coded radio signal, which is transmitted by radio to the Radio Control Receiver within the robot. The signal is received and then decoded by the microcontroller, which is on the main circuit board in the robot. The micro-controller controls functions based on what was sent from the radio control transmitter.

RADIO CONTROL OPERATING INSTRUCTIONS

Refer to the diagram showing the radio control transmitter for the location of controls. Check all of the trim adjustments on the transmitter and make sure they are in their center position. Extend the Radio Control Transmitter Antenna 1/4 to 1/2 way. Turn the Radio Control Transmitter on first and then turn on the main robot power switch. It is necessary for the robot to always have an operating signal when it is on, if there is no signal you will not have full control of the robot.

The right hand joystick controls movement of the robot's drive wheels. Pushing the stick forward will cause the robot to move forward. Pulling the stick back will cause the robot to move backward. Moving the stick to the right or left will cause the robot to turn to the right or left respectively. Movement is fully proportional so any variation or combination of movement is possible. The horizontal and vertical trim tabs to the left and below the joystick are for centering and should be adjusted periodically.

Control of the left and right eyelids is different on each type of radio control. See the diagram for your radio control.

The left joystick left and right moves Pluggie’s eyes. The slider control below the stick should be left in the center so that the eyes stay in the center. Forward movement of the stick controls the tape and back movement controls the siren.

For a detail of other functions, see the radio control diagram on the next page. All of these functions are labeled on the radio control itself.

A charge jack is provided on the transmitter for recharging its internal battery. The recharge jack is typically on the side of the control. The transmitter power switch must be in the off position before charging the batteries. A charge light on the charger will come on while charging.

RADIO CONTROL TRANSMITTER
(Airtronics Champ. Series)

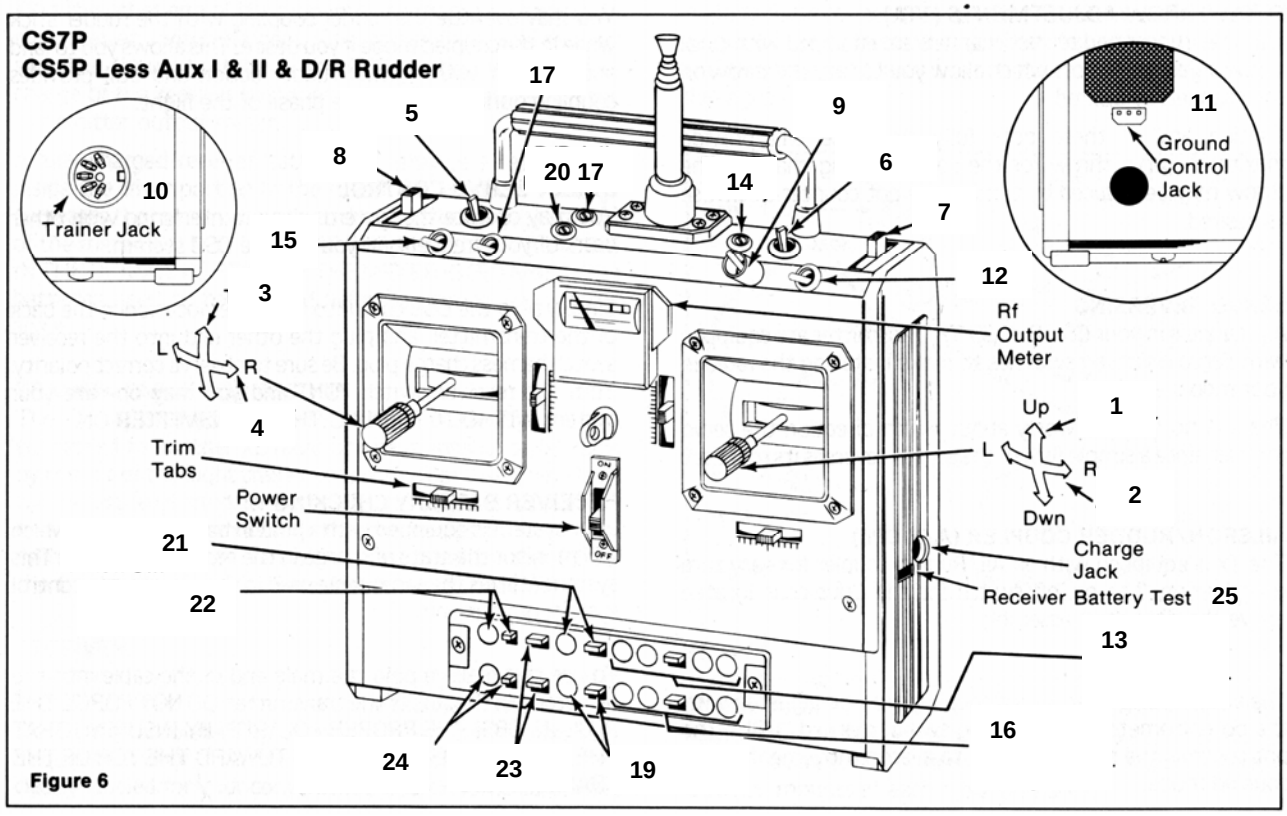


Figure 6

RC TRANSMITTER CONTROLS

Note: The following information on the transmitter controls includes information for a variety of similar robots.

1. Right Joystick up and down- Robot drive motors forward and reverse.

2. Right Joystick right and left- Robot drive motors steering, left and right turns.

3. Left joystick up and down- up activates cassette tape function, down activates optional auxiliary switching function.

4. Left joystick left and right- Optional servo function. (Typically eye movement left and right)

5. Switched servo function (part of channel 5)-siren control.

6. Switched servo function (part of channel 5)-siren control.

7. Optional servo function (Typically right eyelid movement).

8. Optional servo function (Typically left eyelid movement).

9. Coupler switch-couples #4 into #2 (Typically robot turning left and right makes eyes move left and right in unison).

10. No used-trainer plug.

11. Not used-ground control jack.

12. Dual rate switch-two speed switch allows for half-speed movement of the robot, turning left and right.

13. Exponential-Linear adjustment, End Point Adjustment, and Stick Reversing Switch for #2, Drive Motors Turning Control.

14. Dual rate adjustment associated with #12

15. Dual rate switch-two speed switch allows for half-speed movement of the robot forward and reverse.

16. Exponential-linear Adjustment, End Point Adjustment, and Stick Reversing Switch for #1, Drive Motors forward and reverse.

17. Dual rate adjustment associated with #15.

18. Dual rate switch for #4 of left joystick. (leave in off position).

19. Range of travel adjustment and stick reversing switch for #4.

20. Dual rate adjustment for #4.

21. Range of travel adjustment and stick reversing switch for #3.

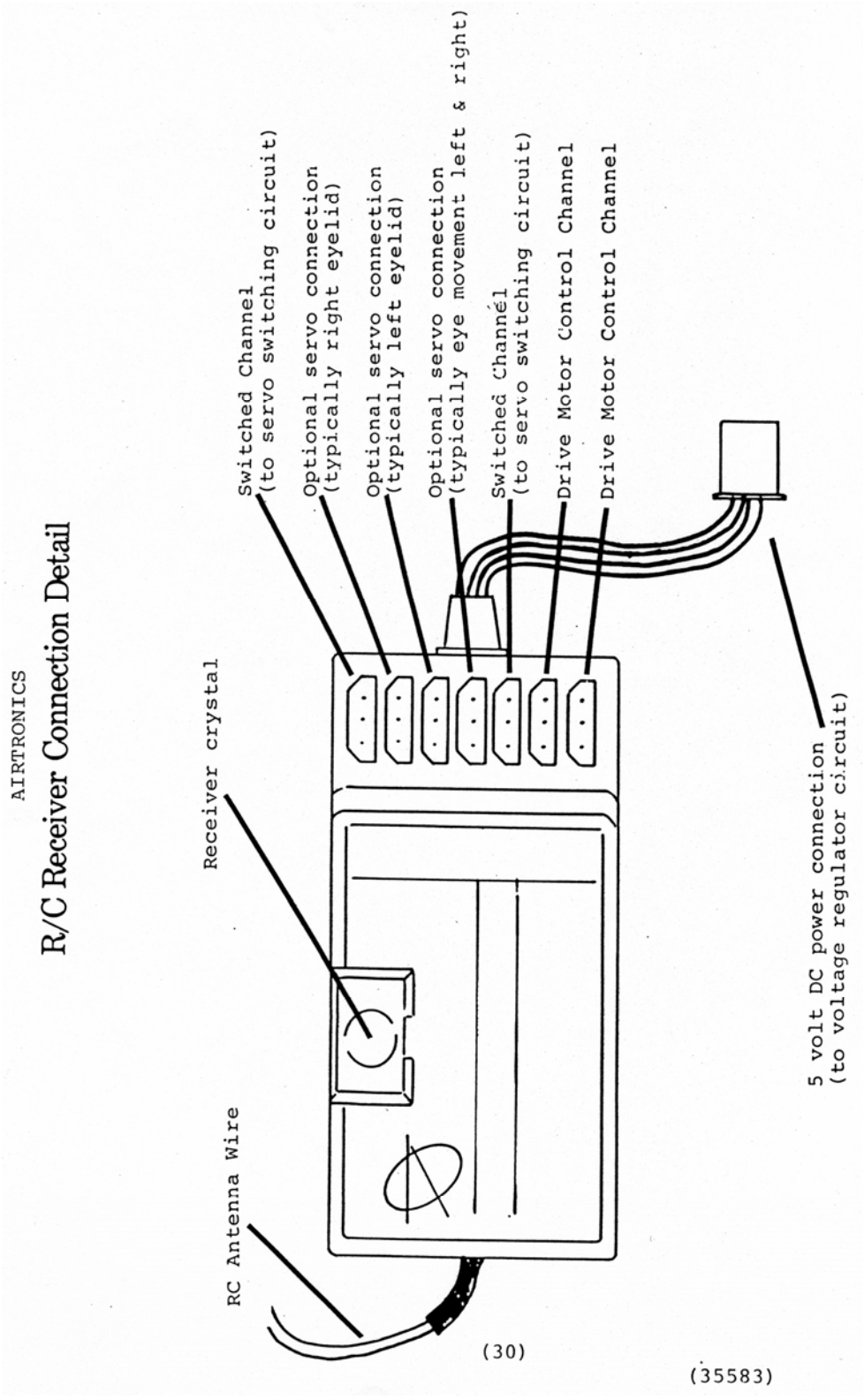
22. Not used-Disconnected function associated with channel 5, shown as #5, on a unmodified RC transmitter.

23. Stick reversing switches for Auxiliary channel I, #7; and Auxiliary channel II, #8.

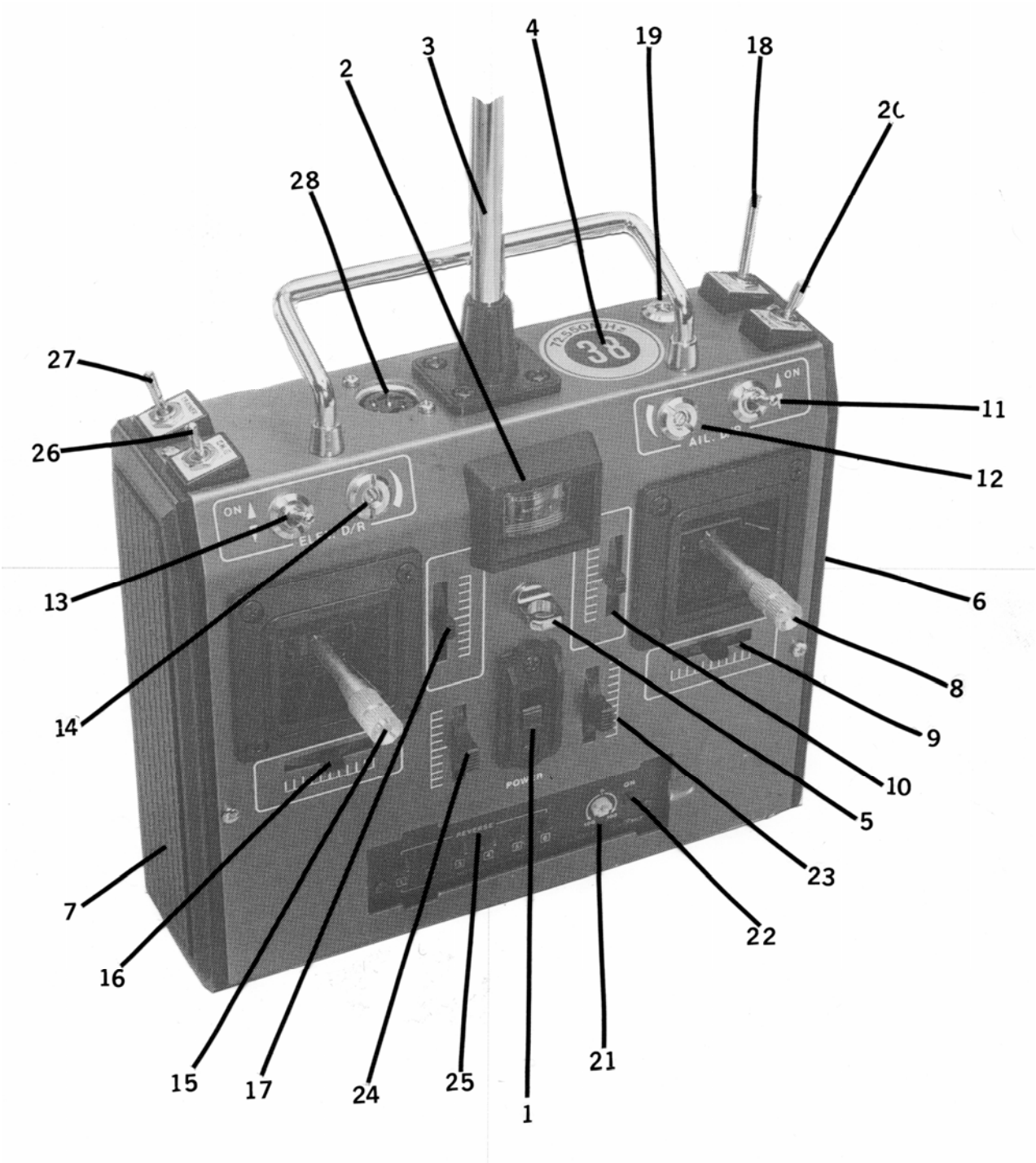
24. Coupling adjustment and reversing switch associated with #9. (Controls direction function and amount of coupling of #4 into #2.)

25. 25. Not used-receiver battery test jack.

RC Receiver Connection Detail
(Airtronics)



Cirrus Radio Control



Cirrus RC Transmitter Controls

1. Power Switch On/Off
2. Output Meter-indicated RF output level and battery charge level.
3. Antenna- during use extend at least half way.
4. Frequency tag.
5. Neck strap mount.
6. Recharge jack.
7. External power jack.
8. Right control stick- Ch. 2- drive forward and rev. drive. Ch. 1- drive left and right movement.
9. Trimmer associated with #8 adjusts centering of left and right steering.
10. Trimmer associated with #8 adjusts centering of forward and reverse drive.
11. Dual rate switch- two speed switch allows for slower movement of robot, turning left and right.
12. Adjustment for #11 sets alternate speed range.
13. Dual rate switch- two speed switch allows for slower movement of robot forward and reverse.
14. Adjustment for #13 sets alternate speed range.
15. Left control stick- Ch. 3 up activates switched function/down activated another switched function. Ch. 4 left and right control optional servo function, usually eyes left and right.
16. Trimmer associated with #15 adjust centering of stick movement left and right.
17. Trimmer associated with #15 adjust centering of stick movement up and down.
18. Dual rate switch for Ch. 4 (not used)
19. Adjustment for #18 (not used)
20. Eyes to turns coupling-makes Ch. 4 move with Ch. 1 so eyes look in the direction the robot is turning.

21. Adjuster for #20 affects amount of coupling of Ch. 1 to Ch. 4.

22. Mixer switch (should be on)-mixes channels 1 and 2 equaling together for proper steering and drive control of the robot.

23. Channel 6 control lever – used normally for control of the right eyelid.

24. Channel 7 control lever- used normally for control of the left eyelid.

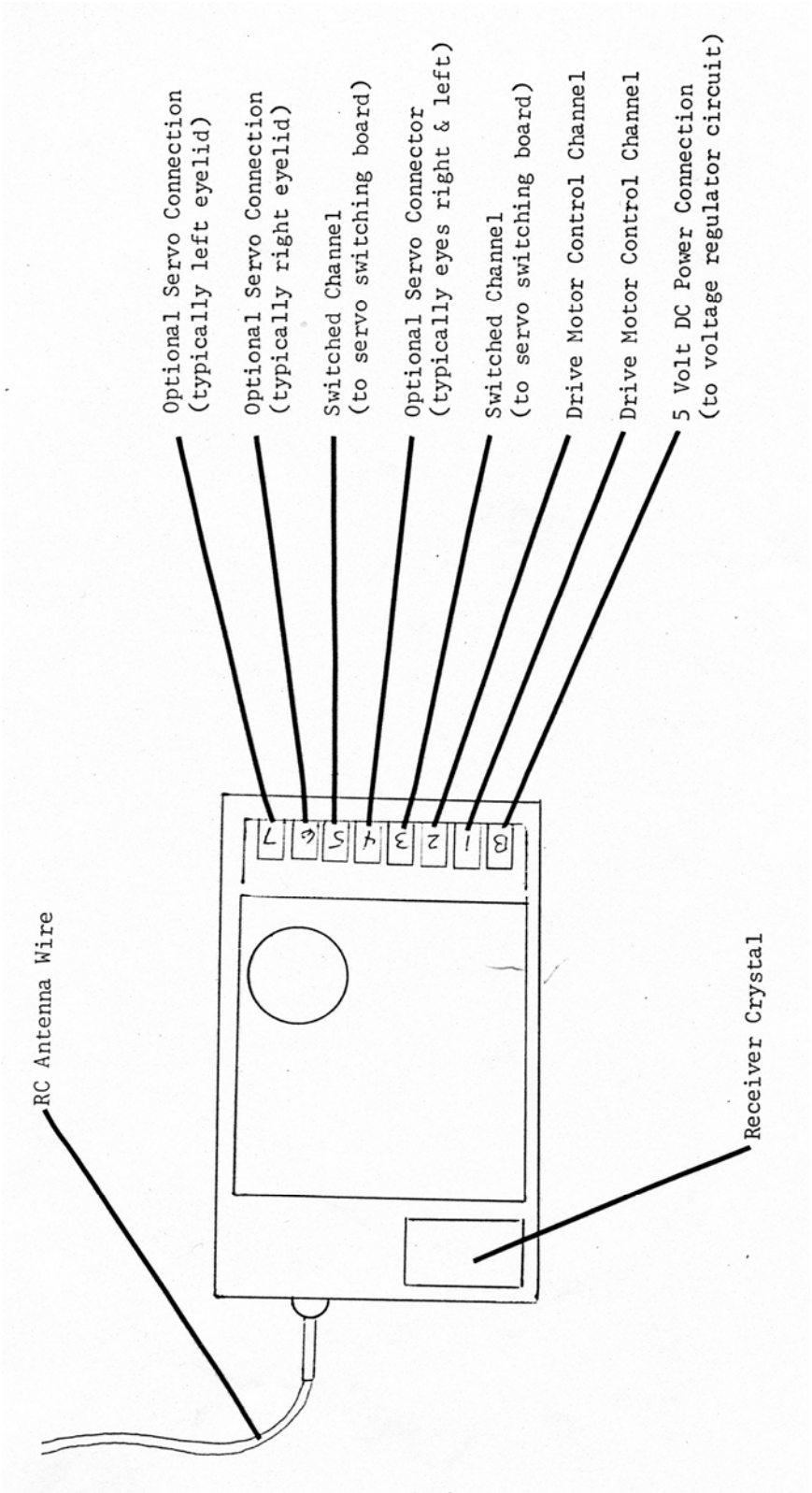
25. Reversal switches for channels 1 through 6.

26. Channel 5 lever switch- 3 position switch controls “on-off” functions of the robot. Center position is off.

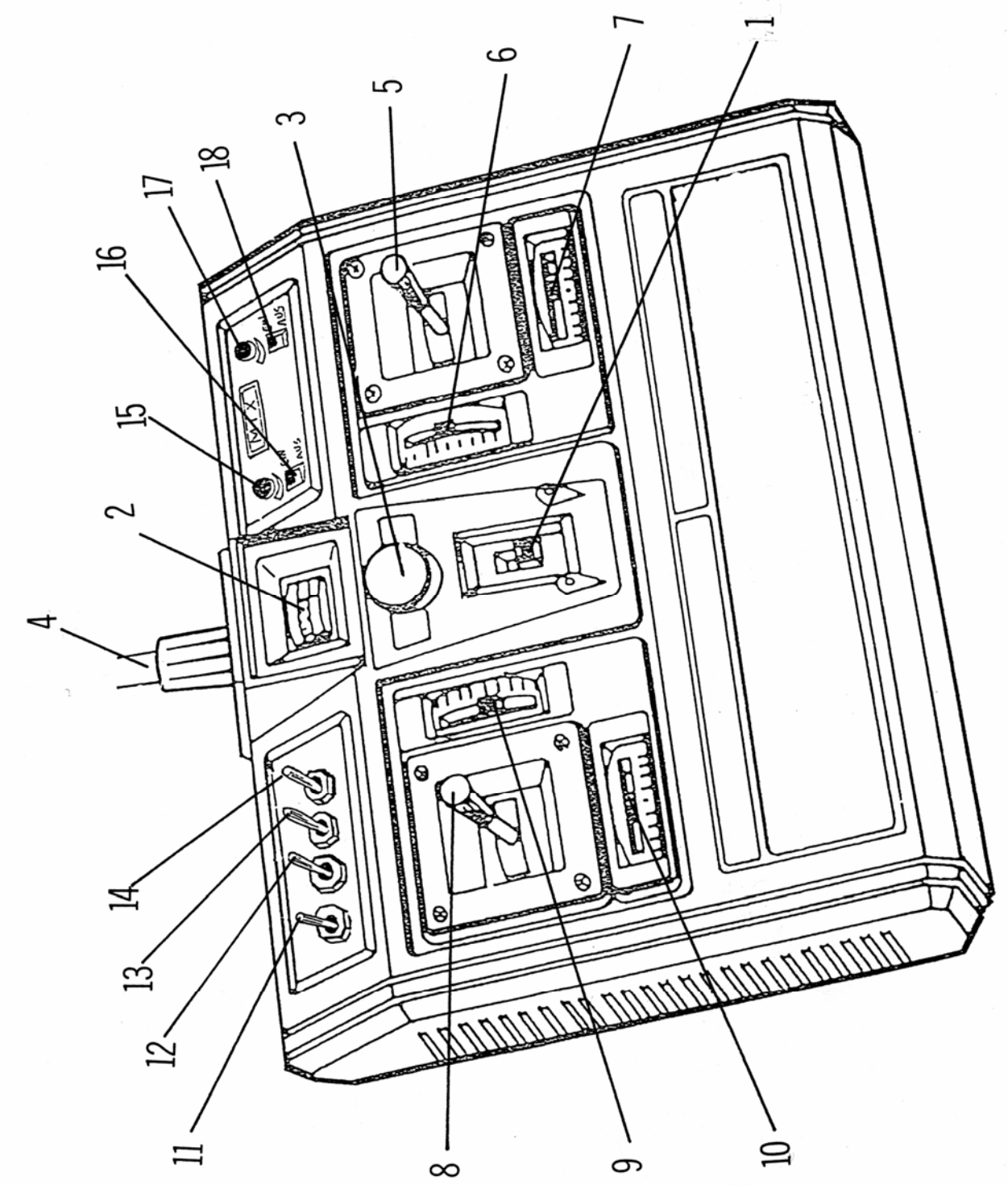
27. Trainer switch- not used.

28. Trainer jack- not used.

Cirrus RC Receiver Connection Detail



RADIO CONTROL TRANSMITTER
(Robbe Terra Top)



RC TRANSMITTER CONTROLS

Note: The following information on the transmitter controls includes information for a variety of similar robots.

1. Power Switch.

26. Transmitter Battery Voltage Meter (Expand Scale Voltmeter)

27. Transmitter Battery charge Socket.

28. Telescopic Transmitter Aerial.

29. Right control Stick-
Up and Down – Robot drive motors, forward and reverse.
Right and Left – Robot drive motors steering. Left and right turns.

30. Forward/Reverse Trim lever for right control stick. Normal = Center. Neutrals the drive motors. If the robot is moving slightly slide this a few clicks until robot stops moving.

31. Left and Right Turns Trim Tab.

32. Left Control Stick
Left and right movement - Turning of the eyes left and right.
Up- Tape and Down– Siren

33. Up/Down Trim Tab for left control stick.

34. Left and right Trim lever for right control stick. Normal = Center. Neutrals the drive motors. If the robot is moving slightly slide this a few clicks until robot stops moving.

35. Switch-Left eyelid open and close.

36. Switch- Right eyelid open and close.

37. Switch: Up- Light bar or flashing red light / Down- Yellow flashing on Bus and Body lights on other Vehicles

38. Switch: Up- aux. Option / Down- Water Squirter

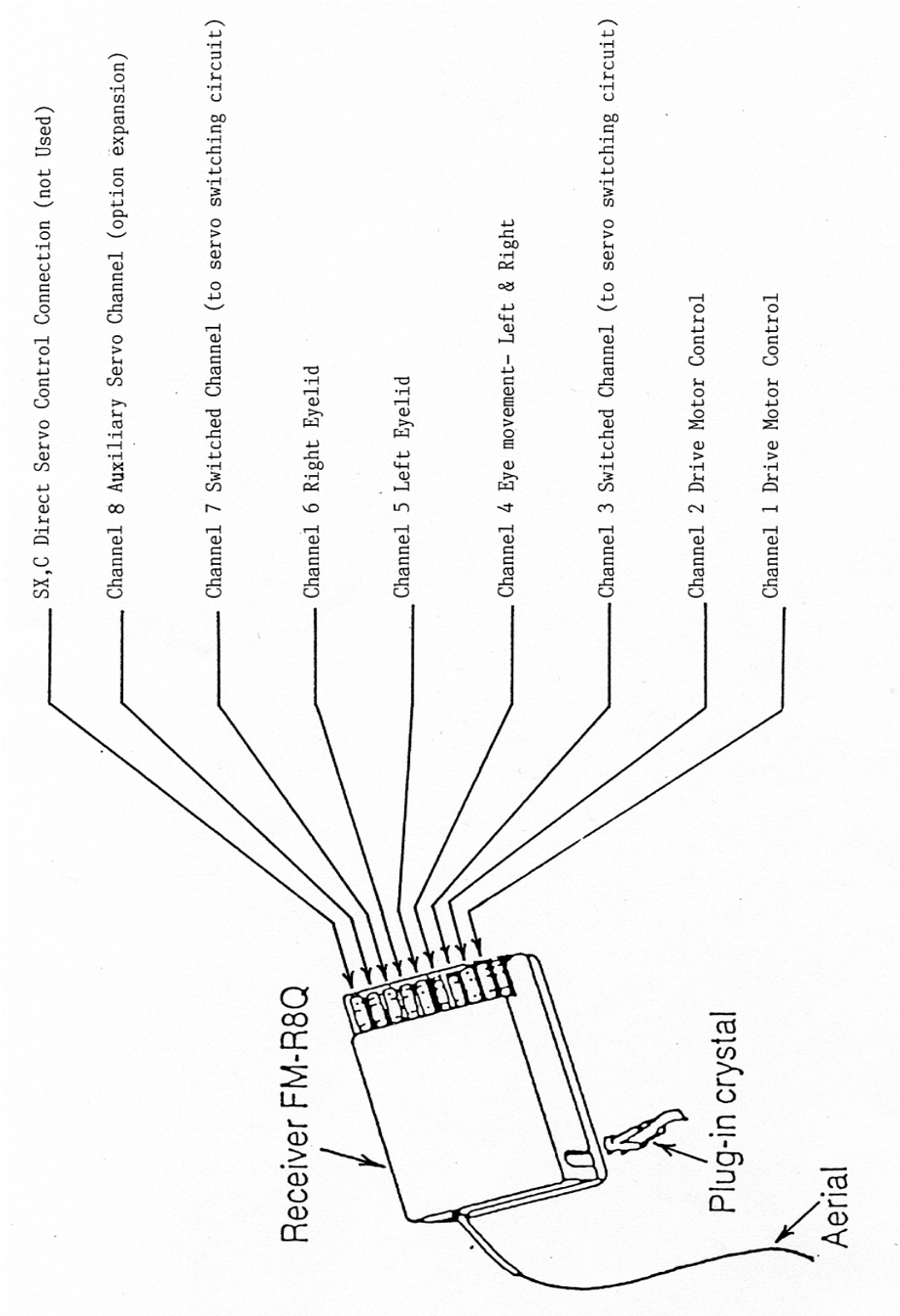
39. Mixing adjustor (Fully clockwise)

40. Mix On-Off (ON)

41. Mixing adjustor (Fully clockwise)

42. Mix On-Off (ON)

RC Receiver Connection Detail



THE NICKEL METAL HYDRIDE (NI-MH) RC TRANSMITTER BATTERY

The NI-MH RC transmitter battery will last about 5-6 hours on a full charge. Charge the battery for **16 hours**. A charge jack is provided on the transmitter for recharging its internal batteries. This round jack is located on the right side of the radio control. (See the radio control diagram) The RC power switch must be in the off position when the charger is plugged into it and must remain in the off position while charging. A light on the charger will be on, when charging.

Note:
On Airtronics and Cirrus RCs the recharge jack is on the side of the RC

Caution: Do not overcharge the batteries as this could cause permanent damage to the transmitter batteries. (Doubling the normal charging time is the type of over charging that is meant here, and the battery getting hot.) When the battery level needle goes in the red, the robot should be turned off because the robot could act erratic without the transmitter signal.

To avoid a RC battery going dead during a presentation, start the program with a fully charged battery or be aware of how much charge there is left in the battery. If you have an extra battery or the optional 110 Volt RC Power Supply, you can connect one of these and keep going.

NI-MH RC Battery and Charger Specifications

NI-MH RC transmitter battery	9.6 Volts	1300mAH
NI-MH RC transmitter battery charger	11.6 Volts	130mA

Adapter for Charging an Extra NI-MH RC Transmitter Battery

If you have an extra NI-MH RC battery, you can charge this outside the RC. You may want to do this while you are using the robot or if you need to charge both batteries at the same time. The adapter needed to do this is in the control case or it is on your charger. It has a white connector on one side and a connection on the other end that will go directly to your battery. The charging time is still 16 hours.

110 Volt RC Transmitter Power Supply Option

The 110V RC Power Supply is a power unit that plugs into a standard electrical outlet and in to the RC transmitter. This allows you to have continuous power without using batteries. This connects into the same connection as the battery. To make the connection you need to take the back cover off the RC. The wire feeds through a slot in the RC case. When you re-close the case be sure that the wire is not pinched. With this option, you do need to stand near an electrical outlet or have an extension cord.

CHAPTER 3 **Voice System**

The Voice System consists of two separate communication links. One link transmits the operator's voice, which is detected by the microphone on the operator's headset and is transmitted by the 331 transmitter (which is worn by the operator) to the 331 receiver in the robot. The audio signal then goes from the 101 receiver through the mixing circuit and then is fed into the amplifier, which amplifies the signal through the robot's speakers.

The second voice link transmits the audio detected by the Mic element (located in the front of the robot) to the 151 receiver (which is worn by the operator) is amplified and sent to the speaker in the operator's headset.

Important: The operator 331 transmitter and receiver should be kept as far separate as possible, such as on opposite sides of the operator's waist. Do not attach the units together, this may cause interference effects. The antennas should not be wrapped around each other or around the headset wire but should hang freely.

Location of Voice Units

331 Transmitter – Operator wears
331 Receiver - On the frame in the robot.
151 Transmitter - On the frame connected to the microphone wire coming from the microphone on the front.
151 Receiver – Operator wears

How to Operate the Operator's Transmitter

1. Open the battery door.
2. Use a 9 volt alkaline battery and insert it according to the diagram inside the battery compartment.
3. Place the headset on your head and adjust the microphone to approximately 1 inch from your mouth.
4. Plug the round connector from the headset (has three contacts) into the top of the 101 transmitter.
5. Move slide switches to the "ON" position (On the model with the flip open battery door the switches will be in the position farthest away from each other. On the model with the slide battery door, the switches will be towards the center, when on.).
   a. When turning on the power switch, with a fresh alkaline 9-volt, the battery light will blink on momentarily and go out. This indicates that it is powering up and that the battery is good. Because the light is a low battery indicator, when the light is on constant, this indicates the battery is too low-below 7 volts. Replace with a new alkaline battery.

The operator's voice units both have metal clips that contact the posts of the 9-volt battery. These must be bent out from time to time to keep this contact good.

How to Operate the 331 Receiver (in Robot)

There are two adjustments on the receiver. The volume is on the back of the 101 receivers, which you may set to the desired volume. The other adjustment is the sensitivity. This is factory preset to slightly down from fully clockwise. This effects how sensitive the receiver is to the transmitter signal. This would only have to be adjusted if there is squelch when the 101 transmitter is turned off while the robot is still on. If this happens you could always make sure that the operators 101 transmitter is always on when the robot is on, or adjust the sensitivity slightly down. Note: Turn the adjustment as little as possible, because adjusting will affect the range.

Tip: For best range extend the receiver antenna as much as possible, not allowing it to touch metal.

How to Operate the 151 Transmitter (in Robot)

No adjustment is needed. The switches will be preset to on, at the factory. It has the same switches and appearance as the operator's 101 transmitter.

How to Operate the 151 Receiver (Operator)

1. Remove the battery door.
2. Use a 9-volt alkaline battery and insert it according to the diagram in the battery compartment.
3. Plug the small round connector from the headset into the headphone jack on the top of the 151 receiver.
4. Turn the volume knob clockwise to the desired volume (if volume is too loud you will hear a loud high-pitched feedback noise. Turn the volume down until the feedback is gone.
   a. When turning the volume knob on with a fresh alkaline battery, the red light will blink on momentarily and go out. This indicates that it is powering up and that the battery has enough charge on it. As labeled, the light is a low battery indicator. When the light is on constant, this indicates that the battery is below 7 volts. It then would need to be replaced.

The operator’s voice units both have metal clips that contact the posts of the 9-volt battery. These must be bent out from time to time to keep this contact good.

Warnings

1. **Do not unplug or plug in the DC power plug on the 101 receiver with the robot power on.** If the power is left on, the plug will short out and could damage the receiver. The fuse in line on the power wire that is plugged into this receiver may blow. This fuse is a round black fuse holder. If this fuse is not blown but no 101 RX power light is on, check the audio fuse on the main fuse block in the electronics box.
2. Do not leave the voice units in direct sunlight or in a damp place for any length of time.
3. Remove batteries if voices will not be used for any length of time.
4. Keep voices and headset in the carrying case when not in use.
5. Generally when the robot is on, the operator's 101 transmitter should at least be on. This will avoid the 101 receiver on the robot picking up radio frequency interference and putting out static (see intermittent static problem of Voice System Troubleshooting).

Troubleshooting Voice

For any voice problem, perform the following steps first:

1. Check to see that the batteries are good in the operator's 101 transmitter and in the 151 receiver. Normally when you turn the 151 receiver on, the low battery light should blink on and go off. When turning on the power switch of the 101 transmitter, the light should blink on and go off. If either of these lights stays on constant, the 9-volt battery is too low and must be replaced.

2. Check that the battery is in the correct polarity and confirm that the battery contacts are making a solid connection to the spring clips inside the compartment. Bend them out slightly if necessary. If the battery is making intermittent contact in the 101 Transmitter, try a different brand battery. Certain brand batteries have a slightly different size.

3. Check all switch positions both on the operator and robot voice units. This includes the audio and the power switches. See the Voice Unit Diagrams for details about the correct position of these switches.

4. Check all plugs to and from the voices for proper connection.

5. When operating normally, the 101 Receiver in the robot has a red TX light on. The 151 Receiver has a green TX light. This light indicates that a signal is being sent from the receiver's transmitter and that the receiver is receiving this signal.

See the next page for specific problems and their solutions.

Perform the following depending on the symptoms of the problem:

The operator cannot speak through the robot:

1. Perform steps 1-5 above.
2. Turn off and then on, the 101 transmitter (smaller operator's unit). The light (low battery indicator) should blink off and then back on. If it does not, replace the 9 volt battery with a new one and make sure that the battery is making good contact with the battery clips.
3. If the transmitter light does blink on and go out, go to the 101 Receiver in the robot. Look for a power light on the 101 receiver. If there is no power light, check the fuse that is on the power wire plugged into the 101 receiver. This is a black round fuse holder in line at the 101 Receiver unit. This is a 1 Amp Fuse.
4. Activate the cassette to test if the audio system is working. If the cassette fails to play, then check speaker connections and power plugs to the audio booster, and check the audio fuse on the fuse block. This is located inside on the outside of the main electronics box (see the diagrams showing the fuse block). One of these fuses could have blown if the power plug to the 101 receiver was plugged in or unplugged with the robot power on.
5. Check the headset wire plug that plugs into the operator's transmitter. This is a three-pin contact. The robot microphone could be plugged into the 101-voice transmitter in place of the headset wire and plug. This test would determine if the headset is the problem.

The operator cannot hear from the robot:

1. Is there a constant green TX light on the 151 Receiver? No, check the switches on the 151-voice transmitter in the robot. Yes, go to number two.
2. Open the plug that plugs into the 151 Receiver by unscrewing the cover. Look for a broken wire.
3. If the plug wires are good, the robot microphone could be the problem. The robot microphone could be tested by connecting it to the operator's transmitter. After making this connection, talk into the robot microphone. If you hear yourself out of the robot speakers, the microphone is good. If you cannot hear yourself, the microphone plug has a bad connection or the complete microphone and wire needs to be replaced.

The voice operates but at certain distances there is cutout problems:

1. A low battery in the operator's voice units could cause this. If the batteries are good, check for broken or loose antennas on operator and robot voice units.
2. Check for a bad connection on the plugs coming from the headset and plugging into the operator's voice units. Move the headset wires around to determine if there is a bad plug or wire.
3. Make sure that the operator voice units are worn away from each other, on opposite sides of the operator's body. The antennas also should not wrap around each other or the headset wire.
4. Check the receiver for that direction, and make sure that the sensitivity adjust is nearly at full.

151 Receiver = Fully Counter-clockwise 331 Receiver = Fully clockwise.

There is intermittent static coming from the robot, similar to what a squelch would sound like: Turn on the 101 transmitter. If it still exits, adjust the sensitivity one-eighth of a turn counterclockwise from fully clockwise. The sensitivity adjustment is located next to the volume on the 101 receiver in the robot.

FLASHING EYE LIGHTS

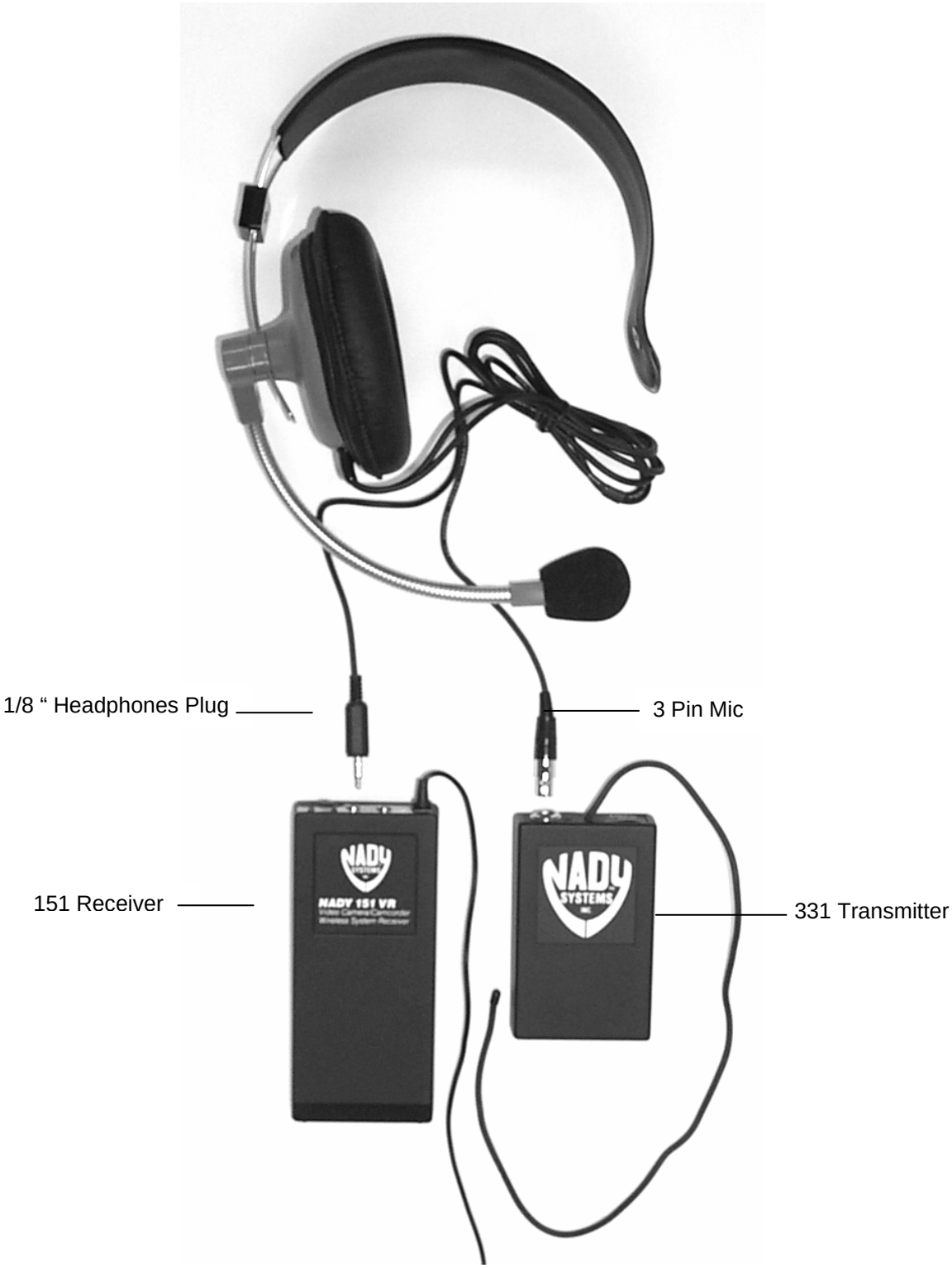
Function-The flashing eye lights is a feature where the eyes flash as the operator speaks through the robot. The amount of the flash is affected by the level of volume of the voice. This level is affected by the 101 Receiver volume level and the position of the headset microphone to the operator's mouth.

Adjustment- The adjustment is preset at the factory and should not need any adjustment. If an adjustment is necessary, see the Main Circuit Board diagram in the Appendix for the location of it. It is labeled Flashing eye lights sensitivity. When this pot is adjusted clockwise this makes the eye lights more sensitive to your voice and turning it counter-clockwise makes it less sensitive.

Location of the Adjustment

On the main circuit board.

Operator's Voice Transmitter and Receiver

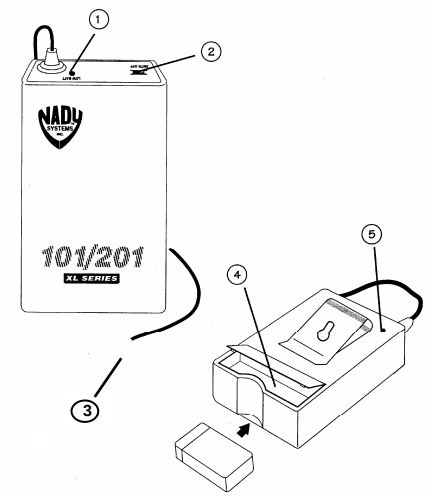


VOICE UNIT DIAGRAMS

101 (Operator to Robot)

331 Transmitter Operation
Operator-labeled LT-SX Transmitter

331 TRANSMITTER

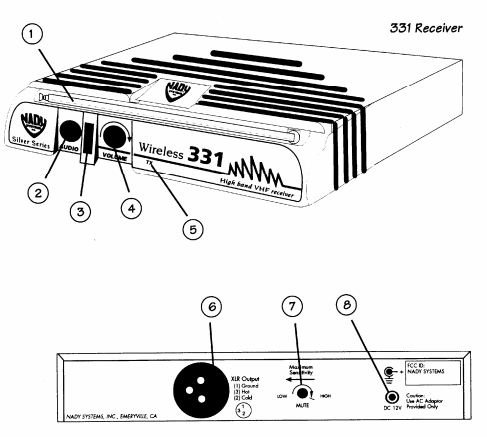


(1) **Low Battery indicator-** Will give a single quick flash when the on/off switch is turned on. When the 9-volt battery is low it will be on constant.
(2) **Off/Mute/On switch**- With flip open battery door-switch toward the outside is on. With Slide open battery door-switch toward the center is on. On some models there is a separate audio switch.
(3) **Antenna**
(4) Battery Compartment
(5) **Audio level trim**- Effects the speaking volume of the robot. Factory preset to maximum, which is fully clockwise.

Plug the headset into the 3-pin jack in the center.
USE ALKALINE TYPE 9 VOLT BATTERIES

331 Receiver Operation (Robot)

331 RECEIVER



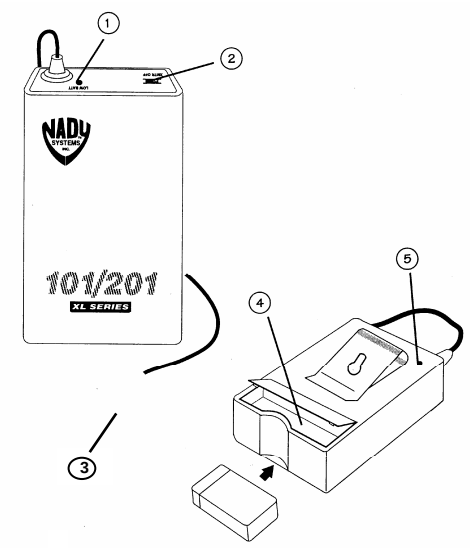
(1) **Antenna**- Extend as much as possible for greater range.
(2) **Audio Out Jack**- Outputs audio to go to the audio booster and then the speakers.
(3) **Power switch**- LED lights when unit is switched on and getting power. Leave on because unit powers up when the robot is turned on.
(4) **volume adjust**
(5) **Red TX LED**- It is on when the 101 transmitter is on because a signal is being sent and received.
(6) **Audio Out** – XLR microphone level output socket. Unused.
(7) **Mute control (Sensitivity)-** Used if RF activity in your area causes loud static through the robot when the 101 transmitter is off. In this case, turn it about 1/8 turn counter-clockwise to eliminate the static. Turning too far will effect range.
(8) **Power input jack- CAUTION:** Do not plug in or unplug with the robot power on.

VOICE UNIT DIAGRAMS

151 (Robot to Operator)

151 Transmitter Operation (Robot- labeled LT-SX Transmitter)

151 TRANSMITTER



The switches are preset at the factory to be on and the adjustment at maximum.

(1) **Low Battery indicator-** Will give a single quick flash when the on/off switch is turned on. Because this unit gets power from the main robot battery if it stays on, the main battery is low.

(2) **Off/Mute/On switch**- With flip open battery door-switch toward the outside is on. With Slide open battery door-switch toward the center is on. On some models there is a separate audio switch.

(3) **Antenna**

(4) Battery Compartment

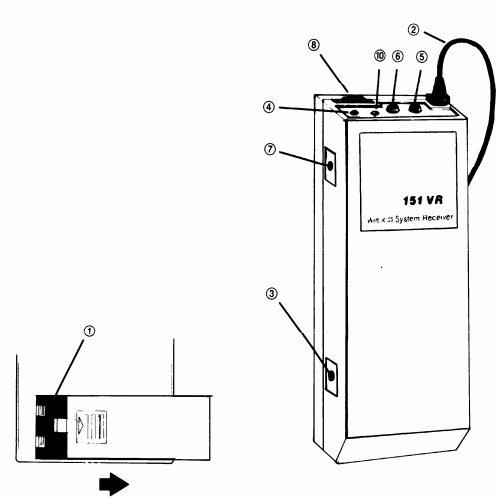
(5) **Audio level trim**- Effects the speaking volume of the robot. Factory preset to maximum, which is fully clockwise.

Plug the headset into the 3-pin jack in the center.

USE ALKALINE TYPE 9 VOLT BATTERIES

151 Receiver Operation (Operator)

151 RECEIVER



(1) Slide off the battery door and insert a 9 Volt battery observing correct polarity.

Turn the receiver on by rotating the on/off volume wheel (8) clockwise. The **LOW BATTERY LED** (10) will flash briefly, indicating adequate battery strength. If the LOW BATT. LED is or constant, during use, replace the battery.

(2) **Antenna**- Hang down fully. Do not allow it to wrap around the headset wire or other antenna.

(3) **Mute control**- Used if RF activity in your area causes a loud static sound in your headset when the robot is off. In this case, turn it clockwise slightly to eliminate the static. Caution: Turning too far will effect the range.

(4) **Green TX LED**- Is on when the robot is on because it indicates that the receiver is picking up a transmission.

(5) & (7) Unused.

(6) **Headphones jack**- Plug the headset into it.

USE ALKALINE TYPE 9-VOLT BATTERIES.

Ohra Voice System – Voice Transceiver

(Voice System used prior to Nady)

OHRA T.M.

WALKPHONE

FULL DUPLEX COMMUNICATOR

OR–200

How to Operate

1. Remove battery cover.
2. Use 9 Volt Alkaline.
3. Place the headset on your head and adjust the microphone to approximately 1 inch from your mouth.
4. Turn power switch to “on”.
5. Move slide switch to “full”.
6. Turn volume knob clockwise to desired level.
7. When you use external battery, be sure to use 2.5mm plug with center polarity + and DC 9V only, otherwise, it may cause damage to the unit.
8. The Walkphone is now ready for simultaneous conversation.

WARNING

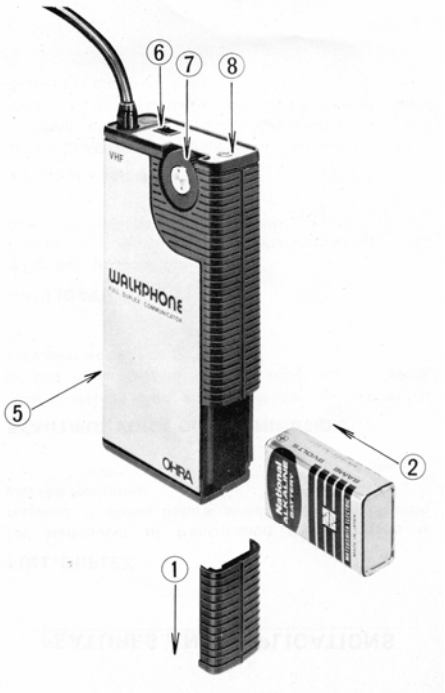
A) Do not leave unit in direct sunlight or in a damp place for any length of time.

B) To extend battery-life, keep the slide switch in "Standby" when not conversing.

C) Turn Power Switch "OFF" when not in use.

D) Remove battery if unit is not to be used for any length of time.

E) Communication is possible only using Model A with Model B or Model D with Model E. Therefore, when obtaining set in pairs, make sure they are right combination.



Ohra Voice Transceiver Specifications and Features

Features

Full duplex two-way communication with standby operation.

General

Receiving System-FM double super heterodyne (simultaneous Full duplex with receive only standby operation.)
Sensitivity-20 db quieting: 1uV (0db)
Modulation Acceptance Bandwidth- 5KHZ
Spurious & Image Rejection- 20 db min.
Frequency Stability- (0 c to =40 c) 5 ppm
Headphone Impedance- 32 ohms

Receiver

Output power- 10,000 uV/m at 3m
Max Frequency Deviation- 4.5 KHZ
Spurious & Harmonic Emissions- 20 db min
FM hum & noise- 40 db
Frequency stability (0c to 40 c) 5ppm
Microphone-electret condenser microphone

Transmitter

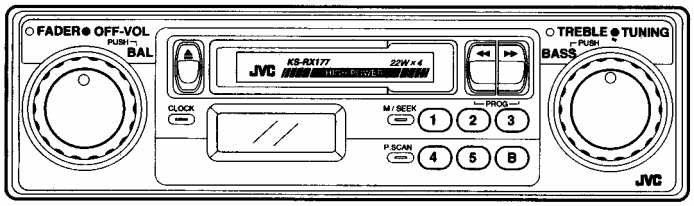
Power Source- 9V Alkaline
Frequency Range- 49.830- 49.890 MHz
Current Drain- Receive only (standby) 25mA
Full-duplex: 60ma max

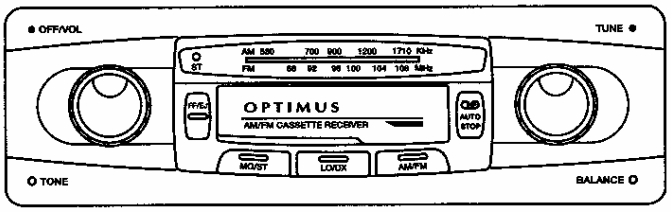
Trouble-shooting

1. Check to see that the operator transceiver battery is good.
2. Check all switch positions both on the operator and robot systems.
3. Check all plugs to and from the robot transceiver for proper connection.
4. If cassette fails to play, then check speaker connections and power plugs to cassette-amp, and check fuse on the main fuse block.
5. Check for broken or loose antennas.

CHAPTER 4 **Cassette Tape System**

The cassette tape player is located inside the robot on the frame. When you pop off the cap, you will see it. If you have a tape in the tape player, to play the music just hit the tape switch on the radio control. Pluggies will get different models of tape players depending on what is currently available. Two common types are shown below with their controls.





How To Play A Cassette Tape

1. Insert a regular type cassette tape into the player with its open side facing right until it locks into position.
2. Activate the tape from the control box.
3. Adjust the volume, balance and tone to the desired level.
4. Press **FF** if you need to cue the music on a different song.

Correcting Tape Tension

Before you load a cassette in your cassette player, take up any slack in the tape by turning the cassette's hub with a pencil. as shown. Tape that is too loose might tangle in the cassette player's playback mechanisms. Do not touch the tape. If you play one cassette a lot, the tape can wind too tightly on a hub and distort when you play it. To restore the tape's normal tension, fast-forward the entire tape and then completely rewind it.

Care and cleaning of the Cassette Player

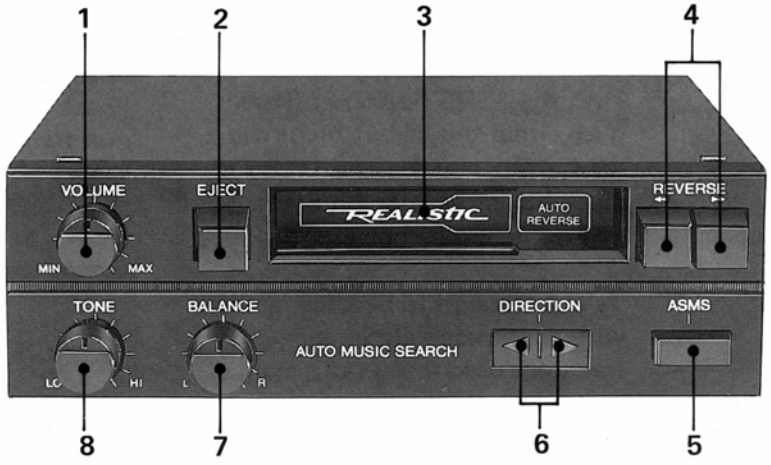
The tape head of the cassette player should be cleaned after every 20 hours of use. Always remove the cassette tape when not in use. This will prevent flat spots on the capstan

roller. Protect the cassette player from dust and dirt, which can cause premature wear of parts. The best the way to do this is to keep a robot cover on the robot when it is not being used.

Trouble-Shooting

1. Is cassette fully inserted.
2. Is the cassette unit receiving power?
   If not check the wiring, plugs and the **audio fuse** on the fuse block.
3. Check the volume control.
4. Is the Radio Control Transmitter "ON" and working? Check if all other functions on the robot working. Listen for the cassette motor. If you hear the cassette motor but no sound, check the connections going from the booster to the speakers. Also check if the voice audio is working through the robot. if it is not, the audio wire on the main circuit board could have come off or the wires are broken. Check the **audio out** connection on the main circuit board.
5. If sound quality is poor, test the cassette tape on some other player. If cassette tape is OK, clean player and try again.

CASSETTE/AMP CONTROLS
Realistic Cassette Unit



1. **VOLUME CONTROL KNOB** adjusts the volume for both speakers.

2. **EJECT BUTTON** ejects the cassette.

3. **CASSETTE LOADING SLOT** receives the cassette for play.

4. **REVERSE/FAST FORWARD BUTTONS** when pushed simultaneously, switch tracks by reversing the tape-travel direction.
pushing either the << button or the >> button activates the fast-wind function, according to the direction of the arrows selected.

5. **AUTO SEARCH MUSIC SYSTEM BUTTON** when pushed in, gives you an automatic search for specific selections. When this function is activated, and then one of the REVERSE/FAST FORWARD (<< or>>) buttons is pushed, the tape moves to the beginning of the next segment of the recording, or moves back to the beginning of the current portion of the tape, according to the directions of the arrows selected.

6. **TAPE DIRECTION INDICATORS** light to show the direction of tape travel.

7. **BALANCE CONTROL KNOB** adjusts the relative volume between the left and right channels. Rotated clockwise, it increases the volume of the right speaker; counter clockwise increases the volume of the left speaker. At center detented position, the sound level from both speakers is the same.

8. **TONE CONTROL KNOB** adjusts the treble response. rotated clockwise, it enhances the treble; counterclockwise decreases the treble.

CHAPTER 5 **Siren**

The robot siren is operated by remote control from the Radio Control Transmitter. The siren circuitry is located on the main circuit board. See the Main Electronics Box diagram, in the Appendix, for the location of the siren volume, mode select and oscillation frequency adjust. The **volume of the siren** is controlled by a trim pot on the main board. Turning the pot clockwise will increase the volume of the siren. Turn the pot counterclockwise to decrease volume. Three different sirens are available. Choose the siren you want by moving the jumper located on the **siren mode select**. To control the oscillating speed, adjust the **siren frequency trim pot** in the siren circuit. The siren mode select is set to the common siren for your robot. If the siren mode select is changed, the siren frequency will very likely need to be adjusted.
NOTE: The volume and oscillation are preset at the factory and do not need to be adjusted unless you want a different volume level or oscillation speed.

Troubleshooting Siren

1. Check if the audio booster is working by testing the voice or activating the cassette player. If you get no voice or cassette audio, check the audio fuse on the fuse block in the main electronics box. Also check the speaker connections at the speakers.

2. Call the Robotronics' Service Department for assistance.

CHAPTER 6 **Robot Battery System**

ROBOT BATTERY

The battery in the robot is a rechargeable sealed lead-acid Gel type battery. This type of battery is very dependable and safe. It can be repeatedly charged and discharged.

To recharge the robot battery, plug the charger into the robot recharge jack located on the bottom back right of the robot. You may have to tip the robot slightly to make it easier to plug the charger plug in. Switch the main **on-off-recharge** switch to the **recharge** position which is typically to the back of the robot. Finally connect the line cord of the charger into a 110 volt AC outlet. You will see the red charge light come on. This light indicates that the battery is being charged. It will be bright red to start with, and will become dimmer as the battery is charged. When the battery is fully charged, the light will be very dim and flashing or pulsing. If the light is so dim that you cannot see it, cup your hands around it or turn out the room lights so that you can see that it is dim and flashing. The charger is an automatic charger because when the battery is fully charged it will charge at a trickle charge. It will recharge the battery full in 10 to 14 hours. This type of charger will not overcharge the battery if left "ON" indefinitely. Avoid leaving it charging for more than 5 days. Generally, remove the battery from the charger when the charger indicates a full charge. If you have two robot batteries and want to charge the battery outside of the robot, follow the instructions given next.

Charging the robot battery outside the robot:

Locate the Pluggie charging cable adapter. This is a cord with a red and black rectangular connector on one side and a round connector on the other side. First connect the round side to your robot battery charger. Next, connect the red and black rectangular connector to the battery. Connect the line cord of the charger into a 110 V AC outlet. The red charging light should come on bright immediately. If the red charge ever cycles on and off in intervals of 3-4 seconds, you may have incorrect polarity problem or a bad battery. Call the Robotronic's Service Department for assistance.

Batteries are provided with a polarized connector to avoid connecting the battery backwards and damaging the robots circuitry. If these connections are disturbed, please be careful to observe proper polarity when reconnecting the battery. Use a digital voltmeter, if necessary to verify polarity of the battery and the connector at the end of the battery.

When removing and inserting the battery in the robot battery compartment, slide the battery in and out carefully.

It is best not to allow the robot battery to go completely dead as this shortens the life of the battery and makes recharging more difficult.

CAUTION: When storing the battery for any length of time make sure the battery has been charged. If a discharged battery is stored for any length of time it will damage the battery and will result in not taking a charge after storage.

The most important thing to do to avoid damage to the battery and increase its life, is to **recharge the battery back to a full charge after each use.**

Trouble-shooting

The robot is not getting power:

1. Charge the battery fully. When connecting the charger, make sure that the red charging light is coming on. If it is not the charger could be bad or you could have a bad battery connection (wires leading from the charging jack through the main on-off-recharge switch and back to the battery).
2. Pull the battery connector apart and see if one of the four pins has slipped in the connector. If it has, slide it forward and re-connect.
3. Check the fuses on the main fuse block, especially the fuses for the processor and the radio control receiver.

The robot is operating slow and the robot battery does not last the normal 4-5 hours:

This could be caused by a bad battery or battery charger. If the battery was stored on less than a full charge for 2 months or more this could have damaged the battery.

Robot Battery Specifications

Model EP12120 12 Volt 12 AH

Specifications

Nominal Voltage: 12 volts (6 cells in series)

Nominal capacity of battery to a cutoff voltage of .4 volts per cell below initial closed circuit voltage.

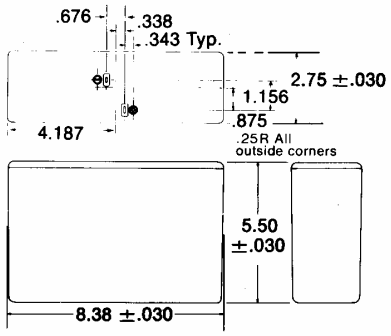
At 20 hour	rate load of 600 ma	12.0 A.H.
At 10 hour	rate load of 1050 ma	10.5 A.H.
At 5 hour	rate load of 1950 ma	9.7 A.H.
At 1 hour	rate load of 7200 ma	7.2 A.H.
At 30 minute	rate load of 12000 ma	6.0 A.H.
At 15 minute	rate load of 20000 ma	5.0 A.H.

Weight: 11 pounds approximate (5000 grams)
Energy density @ 20 hour rate: 1.1 watt-hours per cubic inch
Specific energy @ 20 hour rate: 13.1 watt-hours per pound
Internal resistance: 60 milliohms
Maximum discharge current with standard terminals: 80 amperes
System: fully gelled electrolyte lead dioxide battery
Operating temperature range:
Discharge: −40° to 140°F (60°C)
Charge: −4°F (−20°C) to 122°F (50°C)
Housing Material: case is made of high impact polystyrene

Terminals

EP12120-1 type: Quick disconnect spade type, positive is .250 inches x .032 inches and negative is .187 inches x .020 inches.

Dimensions (inches)



Inch	=	MM
8.38	=	212.85
5.50	=	139.70
4.187	=	106.35
2.75	=	69.85
1.156	=	29.36
.875	=	22.23
.676	=	17.17
.343	=	8.71
.338	=	8.59
.250	=	6.35
.187	=	4.75
.06	=	1.52
.032	=	.81
.030	=	.76
.020	=	.51
.010	=	.26

Care & Application Instructions

1. Recharging Methods: The life and performance of the battery are very much a function of the charger used. In all cases the initial charging current should not exceed 1.70 amperes. The battery is fully charged when the voltage, at room temperature, is maintained at 2.4 volts per cell and the current drops to a level between 24ma and 60ma. At this point the charger should be disconnected or switched to a float voltage of 2.25-2.3 volts per cell. It is important to consult Elpower's Technical Reference Manual for more detailed information.

2. Sealed construction allows the battery to be operated in any position. The battery is protected against internal pressure buildup of more than 6 p.s.i. by self sealing vents, which pass only dry non-corrosive gasses. The gasses consist of hydrogen and oxygen, which are explosive. When installing in equipment care should be taken to insure that the battery's safety seals are free of obstruction and that the battery's compartment is ventilated.

3. Depth of Discharge: Although battery design tolerates deep discharges, for maximum life a low voltage cutoff circuit is recommended for discharges below 1.66 volts per 2 volt cell.

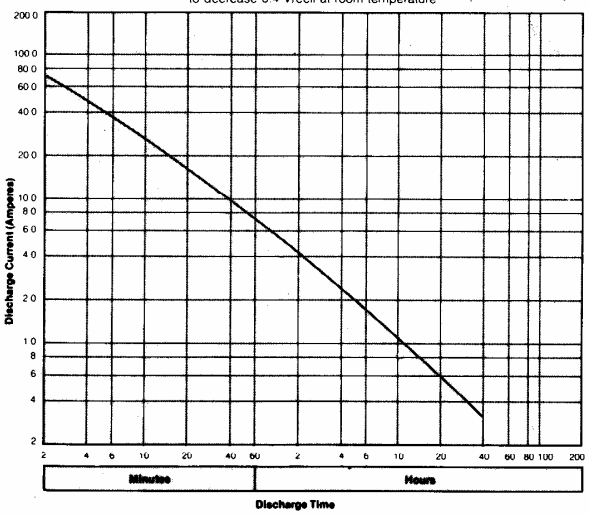
4. Series-Parallel Connection: Batteries may be connected in series to obtain desired voltages and/or in parallel to obtain additional capacities. Combinations of batteries present some special problems that should be considered in circuit design to maximize battery performance. It is suggested that you consult an Elpower Applications Engineer.

5. Storage: Batteries should be recharged as soon as possible after each use and not stored in a discharged condition. Battery life will also be prolonged by storing in cold temperatures; high temperatures on a continuous basis will shorten the battery's life. If batteries are not being used—they should be recharged every six months.

6. Temperature vs. Capacity: The battery is rated at 68°F (20°C); below this temperature its capacity decreases, above this temperature it increases.

7. Additional Information: Detailed information is available on all subjects briefly discussed on this specification sheet. Contact Elpower Corporation or your local Elpower representative.

Discharge Characteristics: Discharge Time* vs. Constant Current Drain
*Time required for the closed circuit voltage (CCV) to decrease 0.4 V/cell at room temperature



The above curves and information on the reverse side are based upon the design characteristics of the battery and its purpose is to provide information relative to battery capacity and specific discharge rates.

Individual battery results will vary depending upon storage, temperature, state of charge, number of cycles and charger characteristics and efficiencies.

New batteries must be cycled or floated appropriately before full rated capacity is achieved.

ROBOT BATTERY CHARGER

Instructions for Proper Use and Operation

WARNING: HAZARD OF EXPLOSIVE GAS MIXTURE

When charging, a lead acid battery gives off hydrogen gas. The Gel type is a lead acid battery with pressure relief type vents. Although it only gives off a small percentage of the gas that a wet lead acid battery does, the following precautions should be observed:

1. Do not position your face over the battery, at any time while making connections while charging the battery outside the robot.

2. Do not smoke, strike a match, or cause a spark in the vicinity of the battery during charging.

3. Charge battery in a dry, well ventilated area.

As additional protection from the hazard of electrical shock:

1. Do not expose the charger to rain.

2. Replace defective cords and wires immediately.

General Information for Charging Gel type Batteries

1. The time required to fully charge a battery will, of course, depend on the battery ampere hour rating and the amount which the battery has been discharged.

The charger red light is your best indication of the battery's state of charge. If it is bright red and it continues to stay bright red, the battery is discharged. If the light initially is bright red but then dims and begins flashing or pulsing, the battery is charged.

2. ⚠ When connecting the battery charger to the battery, if an audible click is heard and the red light goes bright on and then off in intervals of 4-5 seconds, disconnect the charger plug immediately. There is possibly a reverse polarity problem. Examine the wires making sure red goes to red and black to black. Check the connection of the wires to the battery posts. The red wires must connect to the post labeled positive (+), and the black wires to the post labeled negative (-).

If the charger does not come on at all, the battery could have a shorted cell and needs to be replaced. A battery which behaves in this way is most likely in a "sulfated" condition. The condition is caused by leaving a battery in a discharged condition for a length of time.

⚠ **CAUTION: Leaving the Globe Gel/Cell, or any lead acid battery, in a totally discharged condition for a length of time is the single most abusive condition encountered in lead acid battery usage. It is prevented by recharging the battery, as soon as possible, after discharging it.** A stand in the discharged condition of two or three days is not serious, but **two or three months most likely will damage the battery.**

3. **Important storage information:** A fully charged Gel type battery can be left in storage for, at least, three months under normal conditions. If the storage temperature is above 90 degrees F, the battery should be connected to the charger every month for 24 hours. At lower temperatures, a "boost" charge for 24 hours need only be done every three months.

4. This charger is not recommended for continuous charging of Gel type batteries. The charger should be disconnected from the battery once the red charge light shows the battery to be fully charged or approximately 14 hours of charge time. Because of the automatic nature of this charger, no harm will be done if the charger is occasionally left on for a week after the battery reaches the full charge condition.

CHAPTER 7 **Drive Motor System**

Your robot is provided with two high quality industrial grade drive motors. Each motor controls a drive wheel-left and right. Steering of the robot is accomplished by varying the speed and direction of these motors. For example, when the left motor runs faster than the right, the robot turns to the right.

Each drive motor is connected to its drive wheel via pulleys and 1/2" wide rubber timing belts. The pulley set screws and bolts should be kept tight.

Trouble-Shooting Drive

Perform the following steps first when trouble-shooting a drive problem:

1. **Do the other radio control functions operate?** Do the other RC features work such as siren and tape? If they do not, check the fuses on the robot battery and fuses on the main fuse block in the main electronics box. Especially look at the fuse labeled 5 Volt Regulator Processor and 5 Volt Regulator Receiver (see the fuse block detail in the Appendix).

2. **Check drive belts and motor pulley set screws.** Especially if you hear the motors activate but the robot does not move.

3. **Check connections to power drivers and motors.** These are blue and white wires coming from the power drivers and going to the drive motors. The joystick could be pushed in the on position while the connector is being checked for an intermittent connection.

Perform the following depending on the symptoms indicated:

Note: The best way to look at what the drive motors and wheels are doing is to put something under the back of the robot to get the wheels off the ground. You will then be able to see exactly what motor and wheel is working or not working, and in what direction.

Neither drive operates: Check the in line fuse on the power wires that are black and red coming from the power drivers. Check the channels on the radio control that control the drive. You can change a function wire at the receiver into a drive channel to see if the channel works.

One drive does not operate either direction: Check the in line fuse on the power wires that are black and red coming from the power drivers.

- **Drive motor**- If the drive motor is the problem, you would have likely heard the motor grinding or scraping before the fuse blew. To test the motor for operation, swap the motor wires. It is best to have the robot wheels off the ground when doing this test, in order to see which wheel is operating. The motor wires are blue/white wires connected to the power driver in the middle of Pluggie. You may have to remove the robot battery, to make the swap. If now the wheel/motor on the side in question operates and sounds fine then the motor is good.

-**Drive circuit**-(motor control) If the drive motor is good, the power driver or speed controller could be the cause of the problem. Since there are two power drivers and two speed controllers, do a swap test to determine what component is the problem.

One drive motor operates only in one direction: On a Robbe Terra Top RC, make sure the mix module switches on in the on ein position. The adjustments should be fully clockwise. Contact the Robotronics' Service Department.

The wheels will not stop moving: To bring the motors to neutral adjust the neutral adjustment on the speed controller. Adjust it until the motor stops.

The robot is not driving straight: (Veering when you drive)

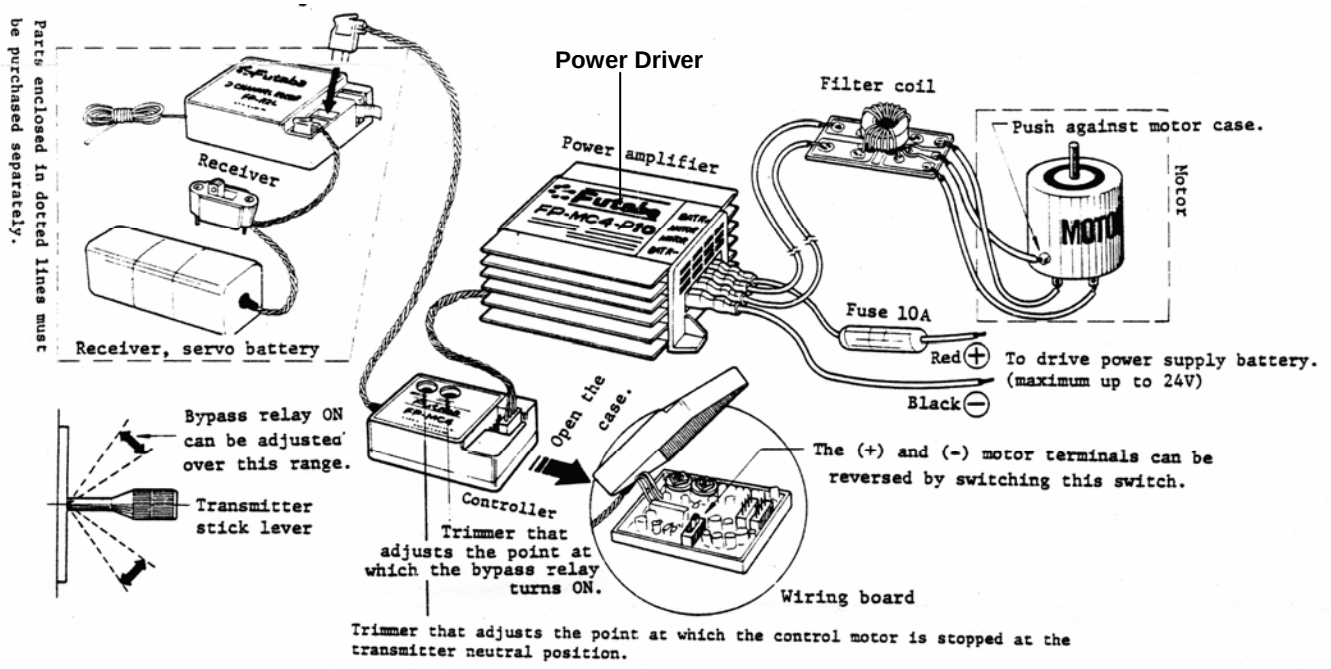
Note: Be sure that both motors are operating forward and reverse at about the same speed, and that the motor pulley set screws and drive belts are tight. If this adjustment is done when there is something else wrong other than the adjustment, it will be difficult to get this adjustment back after the actual problem is corrected.

Find the bypass adjustment on the speed controllers. This adjustment slows the motor down when turned clockwise. On the side that is going too fast, adjust this until the robot is driving straighter.

If the robot veers, the reason is that one motor is going faster than the other at any given position of the joystick. For example if at full speed, the robot veers to the right, this means that the left motor is going faster than the right motor. You may need to do some trial and error to get it just right. To do this, adjust the necessary adjustment pot very slightly and then drive the robot to see if the robot is driving straighter. Continue the adjustment until it drives suitably for you. It is best to use full speed during the adjusting, because this will act as a good reference point.

- Contact the Robotronics' Service Department if you need any assistance or parts.

Drive System Components



Speed Controller

CHAPTER 8 **Eyelids and Eyes Left and Right**

The eyelid and eyes left and right movement is accomplished by three servo motors in the Character or upper robot. When the switch on the radio control is activated, this signal is sent to the radio control receiver in the robot. The micro-controller in the robot decodes this signal and a new signal is sent to the eyes servo board. The eyes servo board is located on the underside of the top of the robot. To see it, the top would need to be removed and the top turned on its side. The wires connected to this board take the signal to the servo itself and operate the shaft of the servo motor to turn clockwise or counter-clockwise for opening or closing. The rotation of the servo motor shaft is coupled to the eyelid and eyeballs with a servo arm and then an eyelid rod.

Troubleshooting Eyes

An eyelid or the eyes left and right does not operate:

1. Check the linkage from the servo motor. Look for the servo arm off the servo shaft or the eyelid off the ball link.
2. Follow the wires from the specific servo motor with the problem. The wire will run to the eye servo board. If it is disconnected, reconnect according to the eye servo board diagram. If the servo does not work correctly (wrong direction), try one of the other outputs on the eye servo board.

One of the eyelids is at a different level than the other:

1. If the eyelid rod is bent, bend it back into position.
2. If the servo saver arm (white and metal arm interconnecting the servo and the rod), is solid and secure the position of the eyelid can be positioned to match the other eyelid. To remove the servo saver arm, the set screw must be removed. The eyelid level can be changed by altering the length of the eyelid rod or changing the position of the servo saver arm on the servo motor shaft.

There is no operation of any of the eye functions:

1. The wires that bring the signal to the eyes servo board are gray and yellow. 5 Volts power is the black and red wires that connect to the eyes servo board. If these wires are connected, follow them back to the board that they originate.
   Wires originate at the Character board.

CHAPTER 9 **OPTIONAL ACCESSORIES**

WATER SQUIRTER SYSTEM

Water squirter parts and where to find them:

Refill bottle - Comes with robot.
Water squirter nozzle - On the right arm.
Water squirter switch - Located on the bottom of the robot next to the overflow nozzle.
In-line fuse (5 Amp-AGC type) Located on a red wire between the switch and the main circuit board.
Overflow nozzle - Located right beside the water squirter switch on the bottom of the robot.
Water line and connector - Located on the top of the frame. Access it by removing the cap of the robot.
Water pump and reservoir -Located on the back of the frame. The body has to be removed to access them.

How to fill your water squirter system:

1. Unplug the water line coming from the water squirter nozzle and plug in the filler bottle in its place.
2. Put the main on-off-recharge switch in the recharge position. This is the fill position.
3. Hold the water squirter switch in the momentary position until water comes out the overflow nozzle. You will fill the reservoir until water comes out. (You may stop sooner if you want.) Be sure that the water is filling in the reservoir.
4. Plug the water line back in and switch the water squirter switch to the "on" position.

How to operate your water squirter system:

1. The water squirter system must have water first. If not, fill your water squirter system. Operating the water pump without water running through it for more than 10 seconds is not good for the pump.
2. The water squirter switch on the robot, must be in the "on" position.
3. To squirt water move the *squirter* switch on the radio control transmitter to the on position. This is a momentary spring loaded switch so that you can get short bursts of squirting.

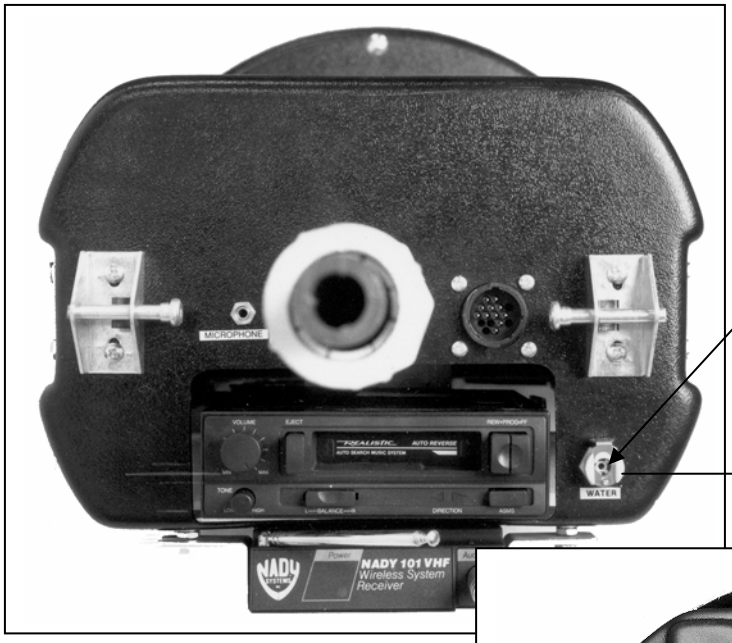
⚠ CAUTION

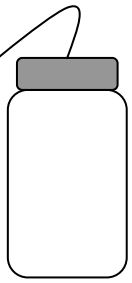
1. The water squirter system should not be operated without water in it.

2. ALWAYS make sure the water line is plugged in when using the water squirter or water may damage the electronics.

The parts of the water squirter are shown on the next page.

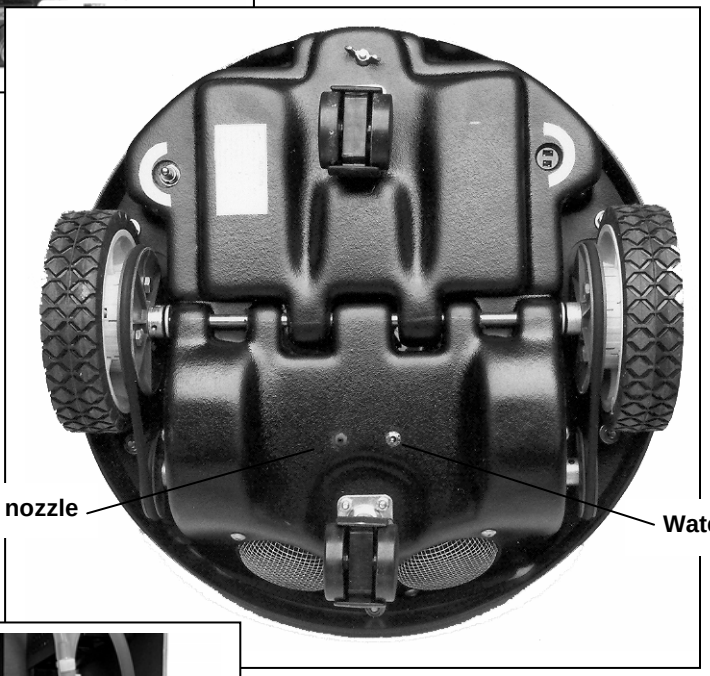
Water Squirter System Parts





Connect Filler Bottle Here to Fill Reservoir

Female Water Connector



Overflow nozzle

Water squirter switch

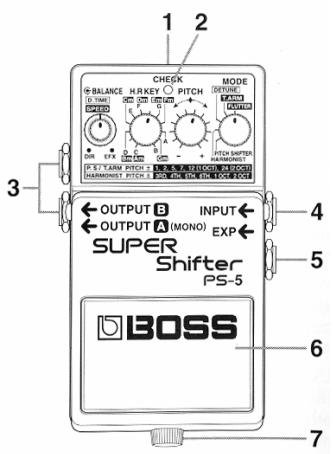
Water pump

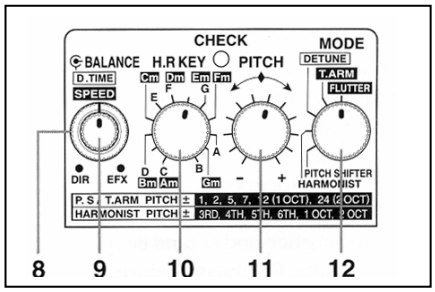
Water Reservoir

On some models the location of your pump and reservoir may be on the front of the frame

OPTIONAL ACCESSORIES: VOICE MODIFIER (PITCH SHIFTER) INSTRUCTIONS

The pitch shifter (voice modifier) can change the operator's voice to disguise it and create a robot character type voice. The operators voice signal is received like normal by the voice receiver in the robot. The signal is then sent from the audio out of the receiver to the **Input Jack** of the pitch shifter. It is modified and sent from the shifter **Output A** to the voice 'audio in' on the main circuit board.





1. Power Jack – 9 Volts center negative
2. Check indicator – Power indicator and show whether an effect is on or off.
3. Output Jacks. Output A is what we us.
4. Input Jack.
5. EXP Jack. No used.
6. Pedal Switch. Turns it on or off.
7. Thumbscrew. To release pedal.
8. D.Time Speed Knob – Delay time. Not used in pitch shifter or harmonist mode.
9. Balance knob – This adjust the output balance between the direct sound and the effect sound. Typically set this on EFX for the full effect.
10. H.R. Key switch. Not used.
11. Pitch Switch. Adjusts the amount of pitch shift.
12. Mode Switch. Selects the mode. Typically use the pitch shifter mode.

When you turn on the robot the shifter comes on. If you do not want it on pop the cap off the robot and underneath you will see a switch to turn it off. Hit the switch to turn it off and hit again to turn it back on. When the pitch shifter is on, the power light labeled 'check' will be lit but you will not be able to see this because it is down in the robot. The shifter will take a few seconds to power up. To turn it off, push the pedal again. If the pitch shifter is not turned on, your unmodified voice will come through the robot.

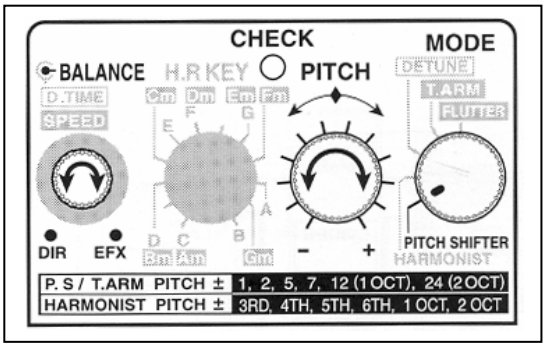
The pitch shifter has two basic effects; a digital pitch shifter and a delay. There are many variations of these two effects. When used as a pitch shifter, you can vary the shift within +/- 2 octaves. Set the mode knob to Pitch shifter and then vary the pitch knob until you get the sound of voice that you want. You can get a similar effect with the harmonist position but the pitch shifter gives you the best sound. These are the most common modes used because these

modes give you the ability to adjust the shift of your voice to exactly what you want whether up or down. About 2:00 on the pitch knob gives you a good voice.

The shifter gets power from the robot battery; no internal battery is needed. The fuse related to the shifter is the audio fuse located on the fuse block.

Below is a typical setting for the robot voice. This will give you a good animated character or robot type voice.

Balance-clockwise
Pitch-About 2:00
Mode-pitch shifter



PART 3

CHAPTER 10 **Assembly & Disassembly**

Removing the cap

1. Put your hands on the bottom rim of the cap, a hand on each side. Give a quick pull up and the cap will pop off the cap rod. It is not necessary to remove any of the nylon bolts to remove the cap. There is a sticker on the black crosspiece listing step by step removal of the body. These steps are listed below.

Removing the body from the frame

1. Remove the cap of the robot as described above.

2. Unscrew the cap nut which is on the cap rod.

3. Disconnect the any and all wire and connectors connecting into the top of the frame. These include:

    - 16 pin round connector (this includes eye servo and eye lights wires).
    - microphone wire with plug.
    - water squirter hose (optional feature).

4. Unlatch the body latches that attach the body to the frame. These are located to the left and right just above the frame. Pull the latch pins inward to unlatch.

5. It is easiest to pull the body off by putting your hands down along the bottom edge of the body at the seams. Pull out slightly and then up. As you lift up make sure that the wires no wires are still connected and that the wires do not catch on the body as you pull it off.

Attaching the body to the frame

Reverse the above steps.

Removing the eye box from the body

1. Remove the three nylon bolts just below the eye holes in the body.

2. As the last one is removed, you will feel the eye box starting to come down. Hold the eye box with one hand and lower it down to the floor. Lift the body up to get the eye box off the floor.

Install the eye box in the reverse order.

PART 4

CHAPTER 11 **Maintenance**

Regular Maintenance Checklist

Periodically the robot should receive a thorough inspection.

1. Examine the exterior of the robot and make repairs as necessary. See the robot body repair instructions if needed.

2. Remove the body. Check all bolts and nuts for tightness.

3. Examine electrical wiring and connectors for looseness and wear.

4. Clean and lubricate mechanical parts of the robot such as the front wheel casters as needed. Inspect the drive belt and pulley system making sure that the motor pulley set screws are tight. You can use belt dressing on the drive belts if they are dry or squeaky.

5. Clean the cassette tape system according to instructions in the Cassette Tape Player pages.

6. Wash the robot body with mild soap and water and a soft cloth and reattach the body. (Rubbing alcohol may be used on stains that won't come off with soap. If this causes the finish of the plastic to become dull, apply ARMOR-ALL brand protectant. Do NOT use alcohol on the eyes.

7. Check the Radio Control System and Voice Transceiver for broken wires, controls, cases, etc. The metal clips that are in the voice units and contact the 9 Volt battery, should be bent out routinely to maintain good contact.

8. Fully charge the battery and test all robot system functions. This must be done on a daily basis when the robot is in constant use. Remember, the robot battery should be brought to a full charge after each use of the robot so that it always has a full charge on it.

To prolong the life of your robot system, always store in a safe place away from **light, dust, moisture**, and excessive heat. **To keep dust and light away from the robot, a robot cover should be used.** The robot and Radio Control Transmitter batteries should be stored fully charged. Transport and store the robot standing up. (Never upside down!)

For a list of recommended tools for a tool kit, see the next page. Ask us about the *Robot Maintenance tool kit* that is available.

Recommended Tool Kit

Fuses- 1, 3, 5, 15, 20, 30 Amp (AGC Type)
4" cable ties
#53 Miniature bayonet bulbs (automotive panel type)
Precision regular Phillips screw drivers
Screwdrivers (flat head and Phillips)
Socket and ratchet set
Needle nose pliers
Crimper/Wire strippers
Wire cutters (diagonal cutters)
7/16" & 3/8" wrenches
Set of Allen wrenches (Especially 3/32" and 1/8" sizes)
Extra 9 Volt alkaline batteries
Small soldering iron and solder
Small can all purpose lubricant
Digital Multimeter (Volts/Ohms)

PAINTING OF THE ROBOT BODY

The following information is only suggestions of painting methods. Contact a professional for assistance.

Preparing the surface:

The robot body is an **ABS plastic** and should be cleaned before painting to remove oils and dirt. This is especially true if the surface has had a protectorant such as Armor-All put on it.
If the body has not had a protectorant or other silicone product used on it, you could clean the area with isopropyl alcohol to prepare it. It helps to smooth the rough edges of the scrapes or scratches before painting with a 600 grit sandpaper. You can lightly sand the area to paint with the 600 grit sandpaper or a Scotch-Brite 7448 pad.

Painting the surface:

Method 1
Enamel spray paints such as Krylon Interior/Exterior enamel could be used. This can be touched up easy if the paint ever got a scuff or scrape but is typically just for painting trim, bumpers, gauge plates etc. Carefully cover parts that are not to be painted with masking tape and paper, to protect against over spray.

Method 2
Note: If you use method 2, you should contact a professional painter that has had experience painting on various types of surfaces. These are automotive type paints and typically include a primer and base coat. For a glossy look you can use a glossy base coat or a clear coat.

Brand- Dupont
Primer: Acrylic Urethane Flexible Primer Surfacer. One brand: mar-hyde (Talsol Corporation). Other brand: 5 Star Auto body Products Maximum 2K(5404) Use with activator (5406).
For additional flexibility: Can use Dupont Plas-stick Flex Additive (2350S) with the primer.
Paint: Acrylic Enamel. Dupont ChromaBase Basecoat.

Brand- PPG
Primer: Check with painter.
Paint: Deltron DBU

Brand- Sikkens
Primer**:** Plastoflex primer by Sikkens
Paint**:** Autocryl by Sikkens (two-part acrylic urethane enamel)

The information listed includes suggestions and general information. This material is designed for application only by trained professional painters using proper equipment.
If you have any questions, call our service department at 801-489-4466.

REPAIR OF THE ROBOT BODY

Materials
Super glue
ABS or PVC clear medium bodied glue
Fiberglass mesh
Rubber gloves

1. Hold the crack together tightly so that the glue you put on the inside of the body does not run through the crack on to the outside of the body. This would etch into the plastic.

2. If there are pieces of plastic reinforcement across the seam or crack that are unglued, PVC or ABS glue can be used between the reinforcement piece and the body. A clamp could be used to hold the plastic tightly together while drying.

3. Cut a piece of fiberglass mesh to cover the crack.

4. Position the body, so that the seam or crack is horizontal to the table. This will keep the glue from running. Apply some of the PVC or ABS glue along the seam, only on the inside of the body. Check to make sure that the glue is not running through the crack on to the outside of the body. Note: Avoid getting the glue on your hands.

5. Immediately put the fiberglass mesh on the glue and pat it down to saturate into the glue.

6. Apply some more PVC or ABS glue over the fiberglass mesh to saturate it some more.

7. It will dry to the touch in about 30 minutes. Allow 24 hours for complete drying.

8. For cracks that need more strength, glue a piece of ABS plastic across the crack with PVC glue.

General Precautions:
Use in a well ventilated area.
Use gloves to avoid getting glue on your hands.
Avoid getting the fiberglass on your skin or clothing. The fiberglass will not hurt you, but could cause skin irritation.
For further precautions, read the super glue, PVC, and ABS container labels.

STORAGE

Storing your robot for any length of time.

1. ⚠ Charge the robot battery. **(Storing the battery for any length of time without being fully charged will permanently damage the battery.)**

2. Charge the RC battery as per instructions.

3. Remove batteries from operator's transmitter and receiver.

4. The RC Transmitter and voice pieces should always be stored in the carrying case; this will extend the life and help insure proper operation.

5. Inspect robot for loose bolts or any additional maintenance that may need to be done.

6. Clean the body and top as per instructions in maintenance section. (If robot is stored with a dirty body it may be harder to clean at a later date, as stains may become permanent.)

7. Storing your robot with a dust cover on it will keep the robot clean and protect the body from scratches. It will also keep ultra-violet light from affecting the ABS plastic body.

8. The robot and batteries should be stored in a dry place between 55-75 degrees F. Storing the robot in a safe place will prevent scratches and extend the life.

9. After storing the robot for any length of time always test the robot well in advance of any scheduled activity as it is impossible to anticipate problems. This will ensure time to correct the problem.

APPENDIX A

Quick Reference Troubleshooting

More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

Problem	Cause	Solution
General No functions operate	1. RC battery not charged	1. Fully charge until the needle is up.
	2. Broken wire from the receiver to main board	2. Resolder or repair wire.
	3. Fuse blown.	3. Check 5 Volt Reg. and processor fuse.
	4. Main board in robot not getting power	4. Check pins of battery and robot connector. Check on/off switch wires. Check ground wires.
	5. Radio Control transmitter or Receiver Crystal broken.	5. Replace crystals. Send RC and Receiver in to determine if it is a crystal.
Voice System <u>Always do the following first:</u> 1. Replace the 9 Volt batteries with new ones. USE ALKALINE! 2. Bend the battery contact out for better contact with the post of the 9 Volt battery. 3. Check power and audio switches, and lights on all voice units. 4. Check plug to and from the voices for proper connection. 5. Check if the transmit (TX) lights are coming on.		
Operator cannot talk	Low Battery	Replace the 9 Volt battery.
	No power to the 101 Receiver.	Check the in line fuse to the Receiver in robot and audio fuse on main electronics box.
	Battery posts not touching the metal clips in the operator's transmitter.	Bend out the metal clips.
	Headset plug to transmitter broken.	Take apart and look for broken wire or solder joint.
Operator cannot hear	Low Battery	Replace the 9 Volt battery.
	Battery posts not touching the metal clips in the operator's receiver	Bend out the metal clips.
	Headset plug to 151 RX has a broken wire.	Unscrew cover of plug and look for broken wire.
	Robot 151 transmitter not turned on.	Turn on audio and power.
	Power plug to robot 151 transmitter unplugged.	Find wire and plug it back in.
	If you have no TX light on 151 RX mute could be out of adjustment	Adjust the mute on the 151 RX to max. which is fully CCW.
Voice Operates but cuts out. Should get 50 feet without any cutouts.	Low Battery	Replace the 9 Volt battery
	Sensitivity Adjustment down too far.	Sensitivity adjustments should be at max. on the 151 Receiver and robot receiver.
	Broken, loose or retracted antenna	Extend robot receiver antenna or replace broken antenna.
Squelch coming from robot	No signal being sent to the robot	Turn on the operator's transmitter.
	Sensitivity is too sensitive.	Very slightly adjust sensitivity down from max. (This will decrease your range)
Squelch in headset when turning robot off.	151 Receiver slightly too sensitive.	Adjust 151 RX mute slightly CW
	151 RX picking up interference in your area.	Always turn off 151 RX the robot.
Cassette Player No tape operation	Tape player no on tape mode	Put mode select to tape
	Play button not pushed	Must push play button before hitting the switch on the radio control.
	Tape is too tight.	Loose with a pencil by spinning.
	Power wire or plug is broken or not connected.	Replace plug or re-connect the wire.
	Radio control or tape circuit not working	Contact Robotronics for help.
No siren, or voice either.	Audio fuse blown.	Replace the fuse. See fuse block diagram.
Poor quality sound or slow.	Belts worn out and slipping.	Replace cassette player or belts.
Siren No siren	Audio fuse blown.	Replace fuse. See fuse block diagram.
Siren volume not loud enough	Booster problem if tape and voice vol. also are not loud enough	Replace or have booster repaired.
	Adjust siren volume if tape and voice okay.	See siren volume adjust on main board.

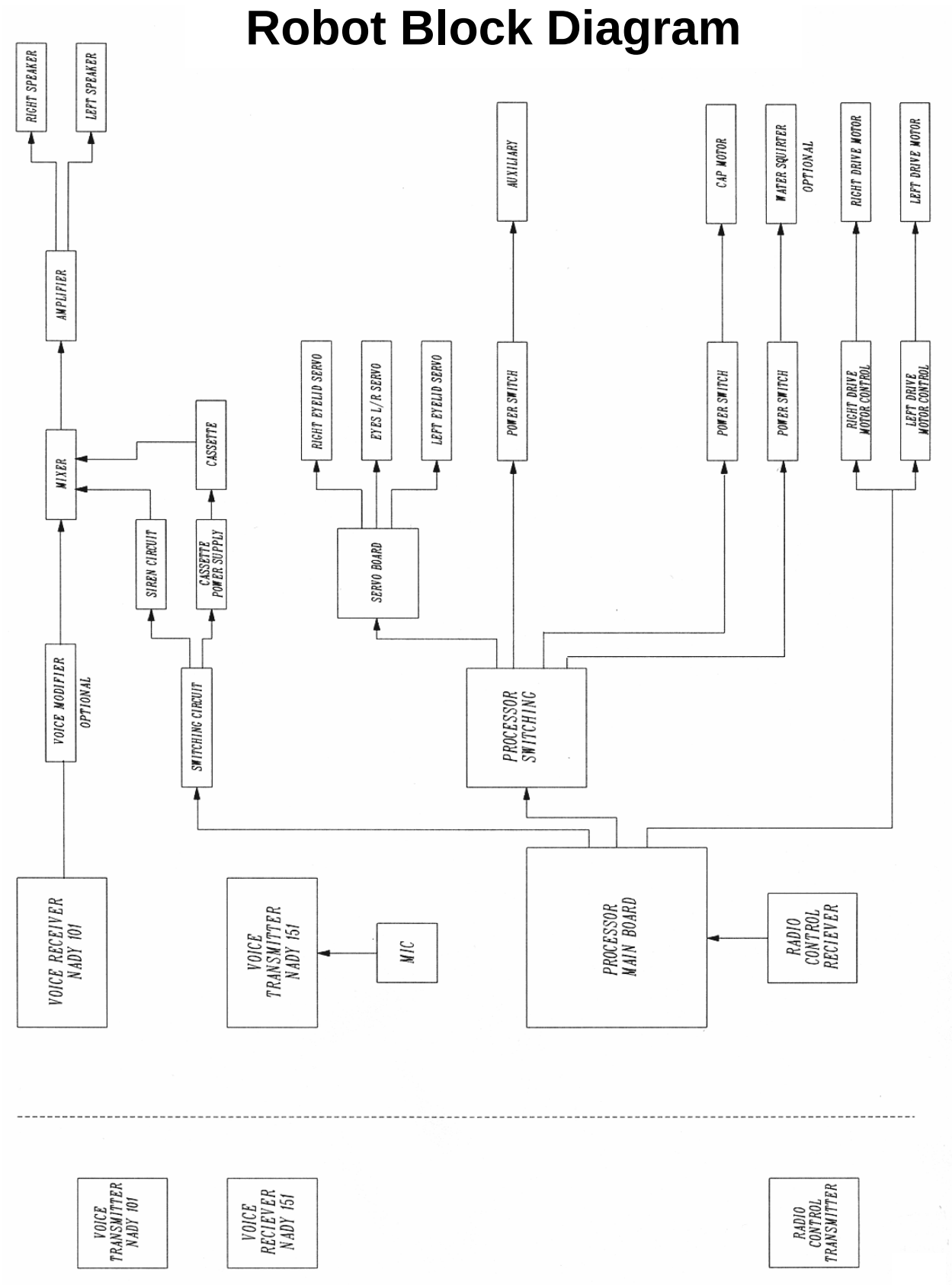
More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

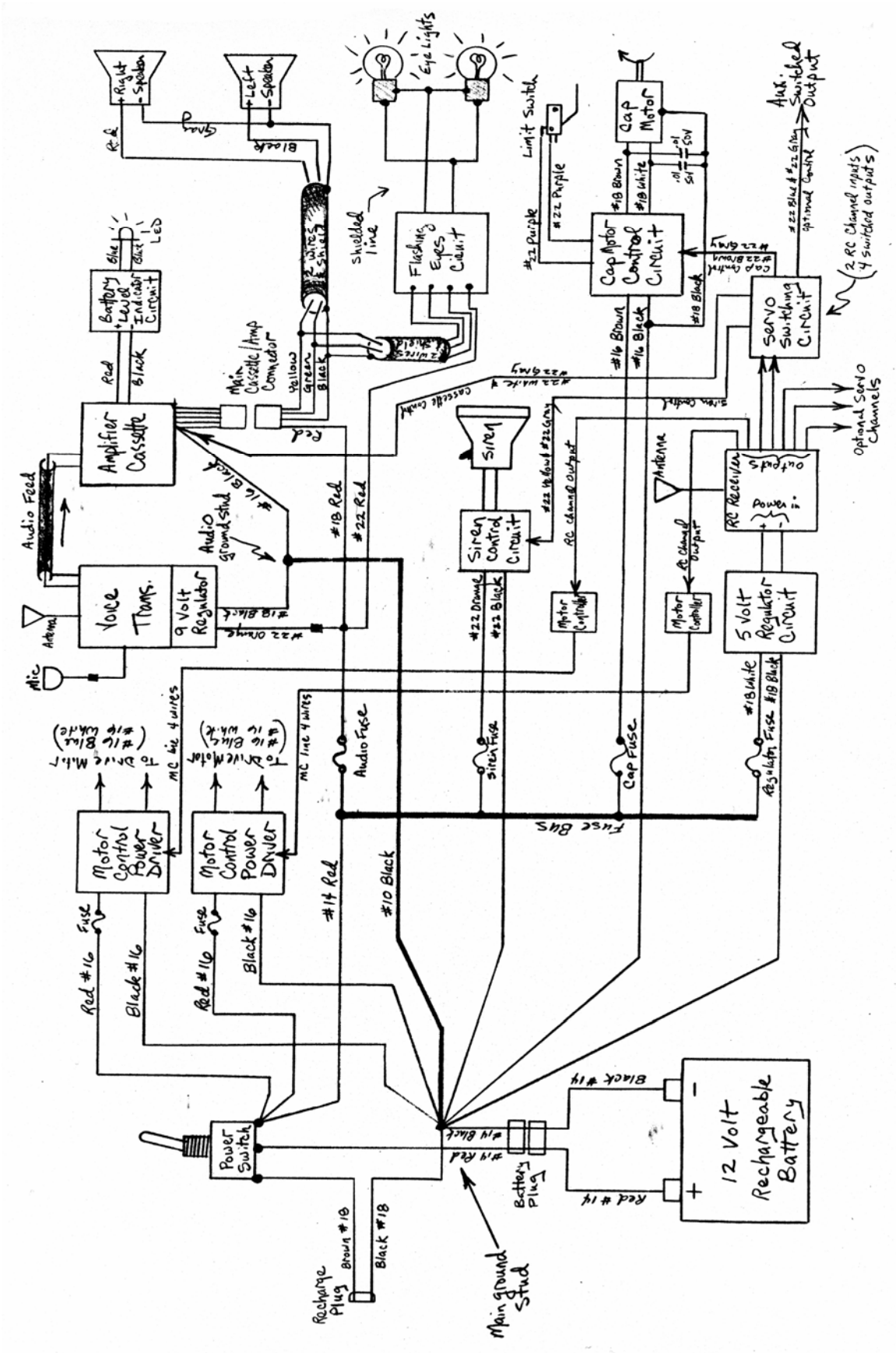
Problem	Cause	Solution
Robot Battery System No functions will operate.	Check wires and connector from battery to the robot.	Push battery connector pins in until it clicks in place. Pin could have slipped out of position.
	Battery is very low or bad.	Charge battery or replace if it will not charge. Also test charger.
Battery will not take a full charge. Needle on charger will not move.	Battery has not been kept fully charged	Charge and discharge repeatedly. Replace battery if it does not start charging.
Drive Motors Neither drive operates only. To correctly evaluate drive problems, look at wheels off the ground.	Both drive fuses blown.	Replace drive fuses on fuse block.
	Radio control drive section problem. Contact Robtronics for help.	
One drive only does not operate. Determine first if it is the drive motor or drive circuit. To do this swap the wires that go to the motors at white connector. Same motor still not working then motor is bad. Problem switches to other motor, then problem is in main box possibly the drive circuit itself.	Drive motor pulley loose.	Tighten motor pulley set screws.
	Broken connection at motor connector.	Check blue/yellow wires and in line motor connector at motor
	Drive circuit not getting power.	Check drive motor fuses on fuse block (blue wires). Check wires coming from fuse block to motor circuit on the main board. Broken solder joint?
	Drive motor damaged.	Repair or replace motor.
	Drive Circuit on main board problem.	Send main electronics box back to Service Dept.
Drive motors moving on their own even when the stick is in the center.	Drive trim sliders not in center.	Move drive stick sliders to center or position to neutral the robot.
	Joystick potentiometer broken.	Send to Robotronics for repair.
Robot not driving straight.	One motor pulley set screw loose.	Tighten set screws.
	Straight drive adjustment needs to be adjusted.	Find adjustment on the main circuit board. See diagram of main board in Appendix.
Eyelids and Eyes Left and Right An eyelid or eyes L/R does not operate	Rod linkage came off.	Get to eyelid rods and ball links and re-attach.
	Servo wire broken or wire came out of eye servo board	Trace wires from servo motor of the eyelid or eyes and follow this wire to the eye servo board to find problem.
One of the eyelids is at a different level	Eyelid rod bent or eyelid out of adjustment	Straighten bent rod or change eyelid position by removing the servo arm. Then shorten or lengthen the rod by twisting the servo arm. You can also change the position of the servo arm on the servo shaft.
No operation of any eye functions.	Connection at eye servo board has come off.	Vehicle- located on underside of upper robot. Robots with Character- located in character.
	Wire(s) bringing 5 Volts and signal to servo board are not making a connection. Broken out of 37 pin connector.	Vehicles- locate the wires (red/black/gray/yellow/black) going from the 37 pin up to the eye servo board. Repair broken wiring. Robots with Character- Check gray/yellow/black and red black to eye servo board.
	No 5 Volts going to eye servo board.	Find broken wire on red/black or check fuse for eye servos on fuse block.

More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

Problem	Cause	Solution
Water Squirter Cannot fill reservoir	In-line fuse blown.	Replace the 5 Amp fuse which is in-line on the wire. Follow wire from water squirter switch.
	Broken wire at water squirter switch or coming from main box	Repair break.
Cannot squirt: no pump sound.	Water squirter switch is not in on position.	On position is not the center position.
	Broken wire at pump or W.S. switch.	Repair/re-solder broken wire.
Cannot squirt: pump sound yes	Reservoir empty	Fill Reservoir with filler bottle.
	Water line is not connected to water connector	Connect it.
	Overflow tube and squirt tube are switched at the reservoir.	Swap them back. Overflow tube is the one that is in the top of the bottle and the tube runs to an outlet on the bottom of the frame.
Voice Modifier Voice not being modified	Modifier not turned on.	Push pedal on modifier. Light should come on.
	Audio wires not plugged in correctly	Jumper wire goes from Nady Receiver to **Input** of Modifier. Wire in **Output A** of modifier goes to the main board.

Robot Block Diagram

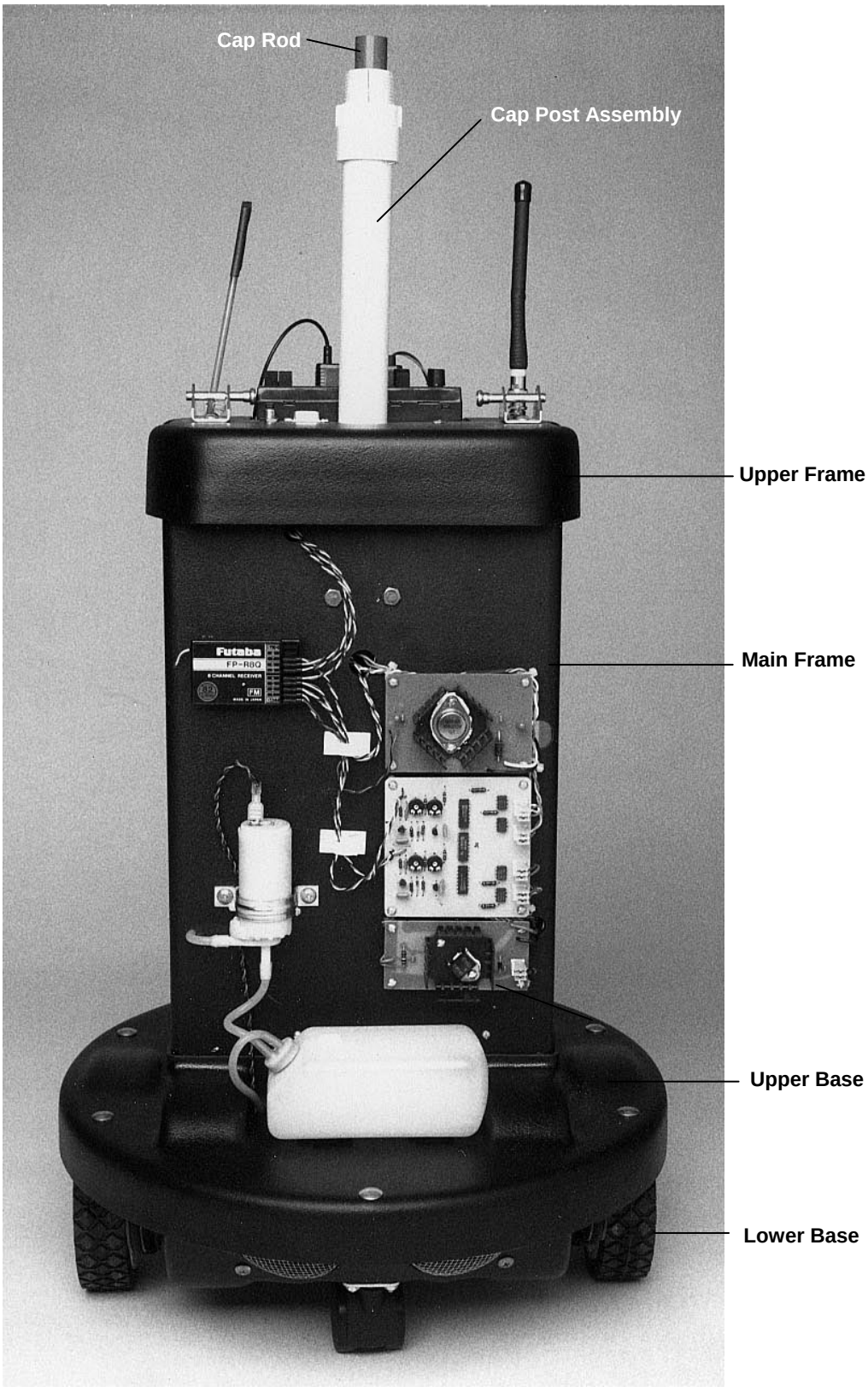



Right Speaker
Left Speaker
Eye Lights
Limit Switch
Cap Motor
Shielded line
Flashing Eyes Circuit
Cap Motor Control Circuit
Battery Level Indicator Circuit
LED
Amplifier Cassette
Main Cassette Jump Connector
Servo Switching Circuit
Audio Feed
Siren
Siren Control Circuit
Antenna
RC Receiver
Optional Servo Channels
Voice Trans.
9 Volt Regulator
5 Volt Regulator Circuit
Motor Control Power Driver
Motor Controller
Audio Fuse
Siren Fuse
Cap Fuse
Fuse Bus
Power Switch
Battery Plug
12 Volt Rechargeable Battery
Recharge Plug
Main ground stud

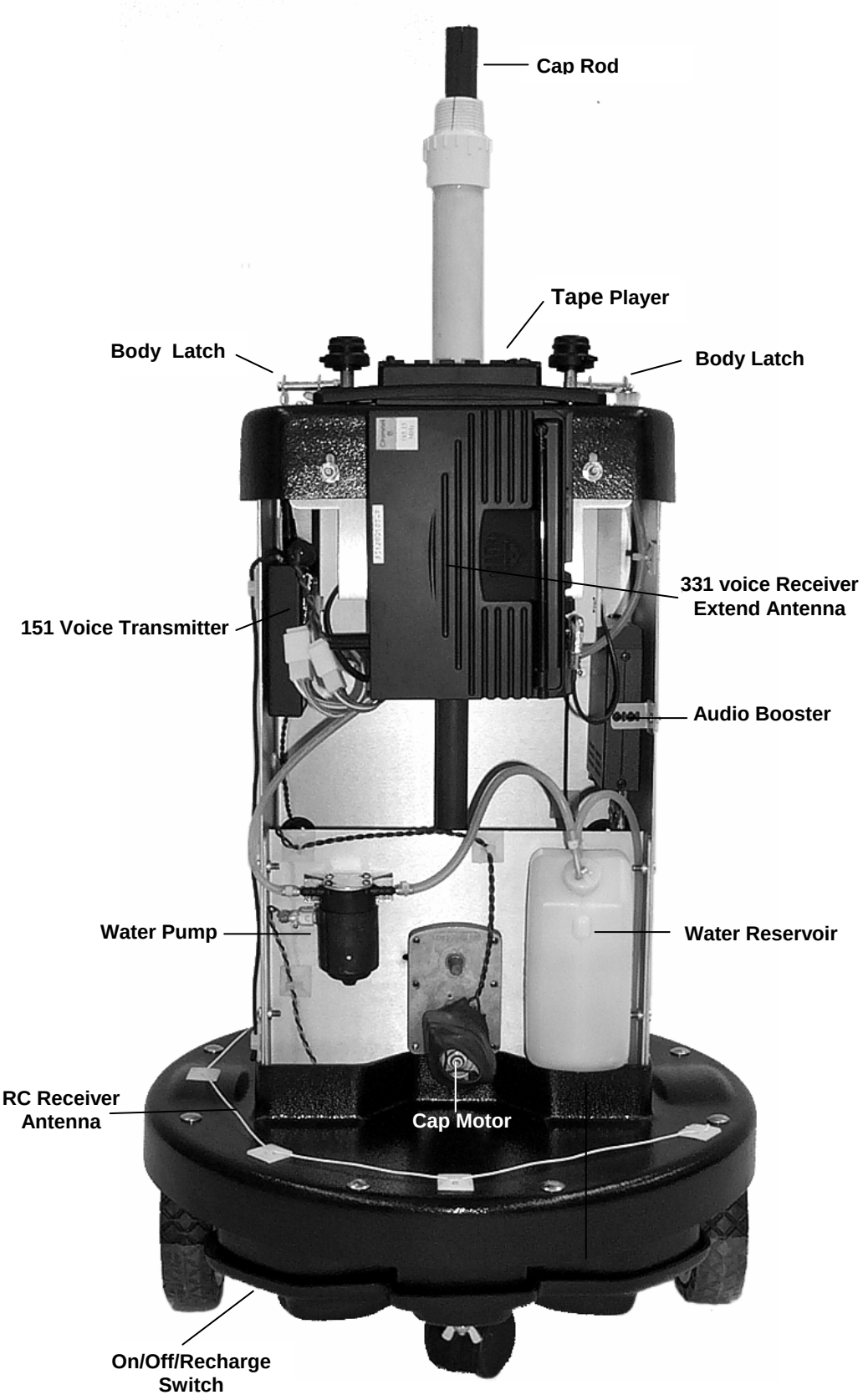
APPENDIX B

ROBOT PARTS IDENTIFICATION

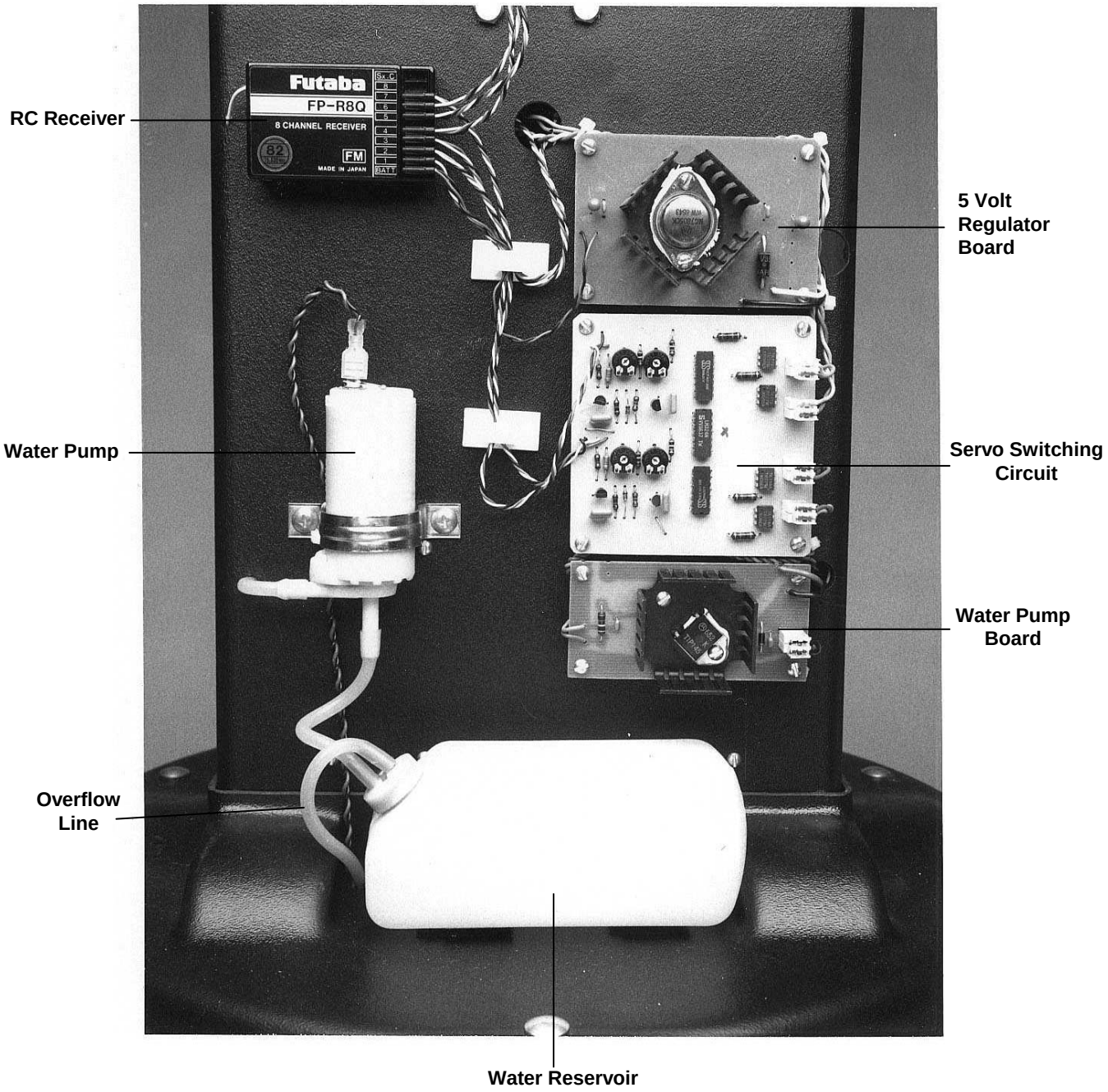
Robot Frame Front View



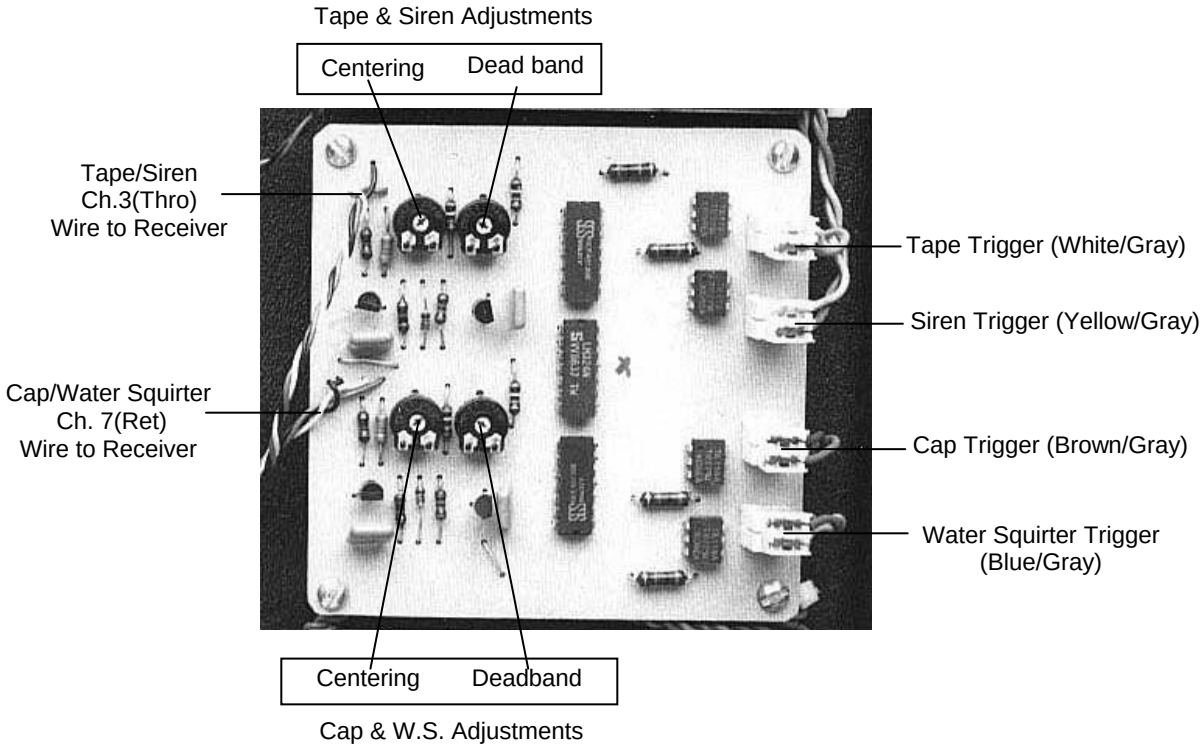
Robot Frame – Rear View



Main Frame Front View



Servo Switching Board



Tape and Siren Adjustment:

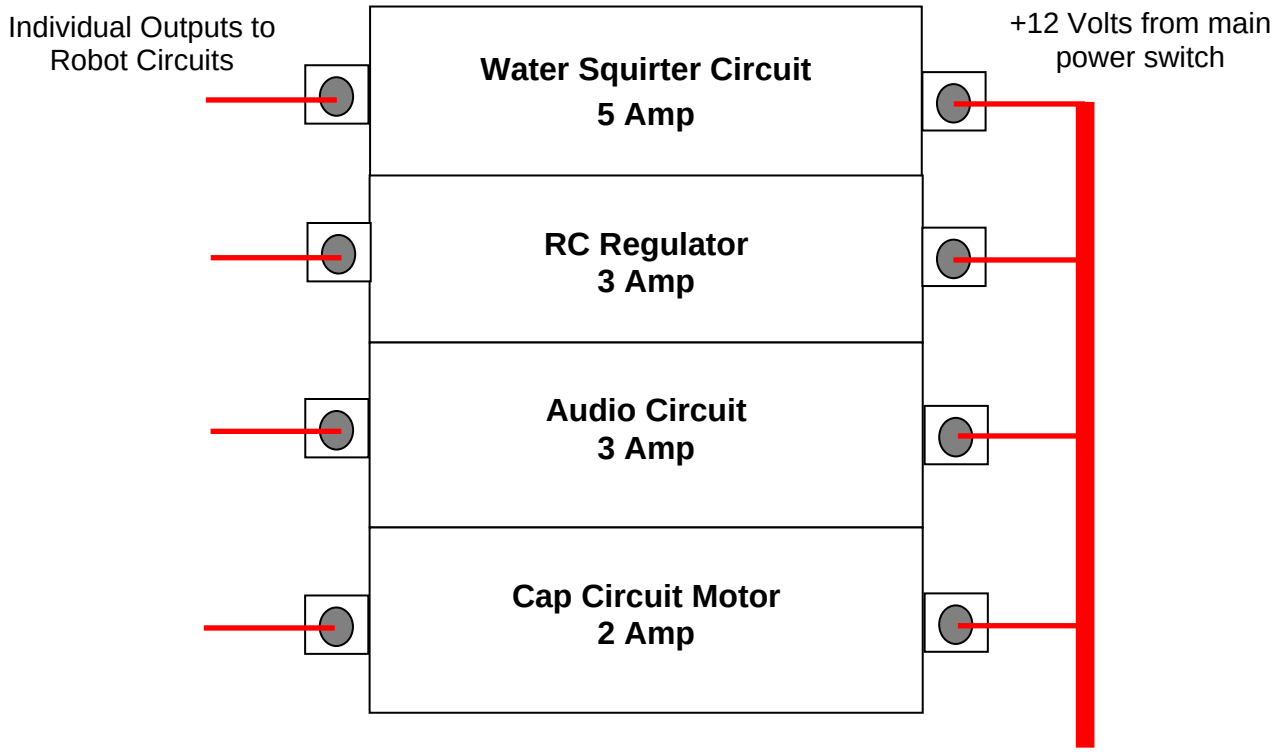
1. Put the stick right in the middle, straight up and down.
2. To center, adjust the centering one way until you find the point that the siren comes on. Adjust the other way until the tape comes on. Put the adjustment right in the middle where both are off.
3. **Optional:** The deadband will adjust the amount of on space or movement of the stick that each function is on. This amount should be about the same for the tape and the siren. If you want you can count the clicks as you move the stick. To increase the on space, adjust the deadband clockwise. After changing the deadband you will need to go back and adjust the centering again.

Cap and Water Squirter Adjustment

1. Adjust the deadband to full counter-clockwise for max. deadband.
2. Adjust the centering just until the cap starts moving. If you do not have a water squirter, turn the adjustment back about an eighth of a turn and the cap should be off. Each time you make a slight adjustment you will need to wait for the cap to cycle up or down to see if it stops.
3. If you have a water squirter you can find the point where the cap runs and then turn the adjustment the opposite way just until the water squirter pump runs. Put the adjustment right in the middle where the cap and water squirter are both off. Note: You have to have the water squirter switch on the bottom of the robot in the on or squirt position.

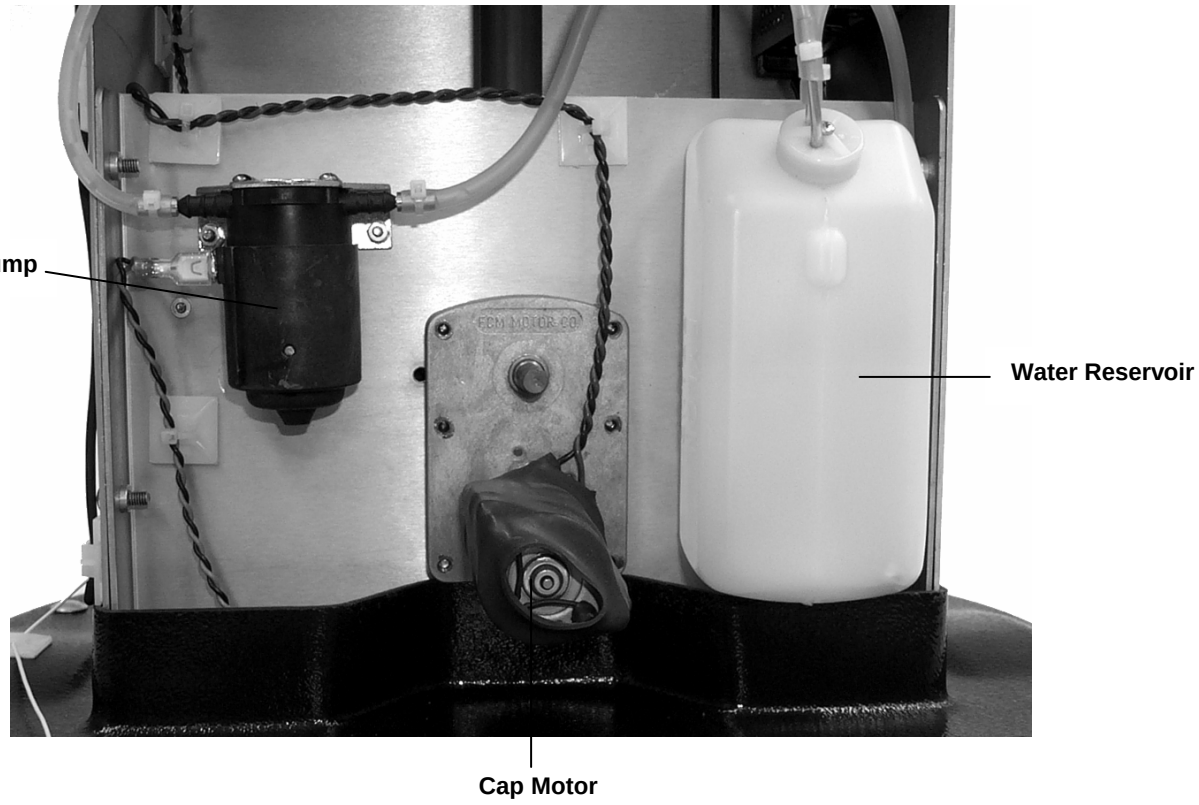
Fuse Block Detail

Use AGC Fast Acting Type Fuses

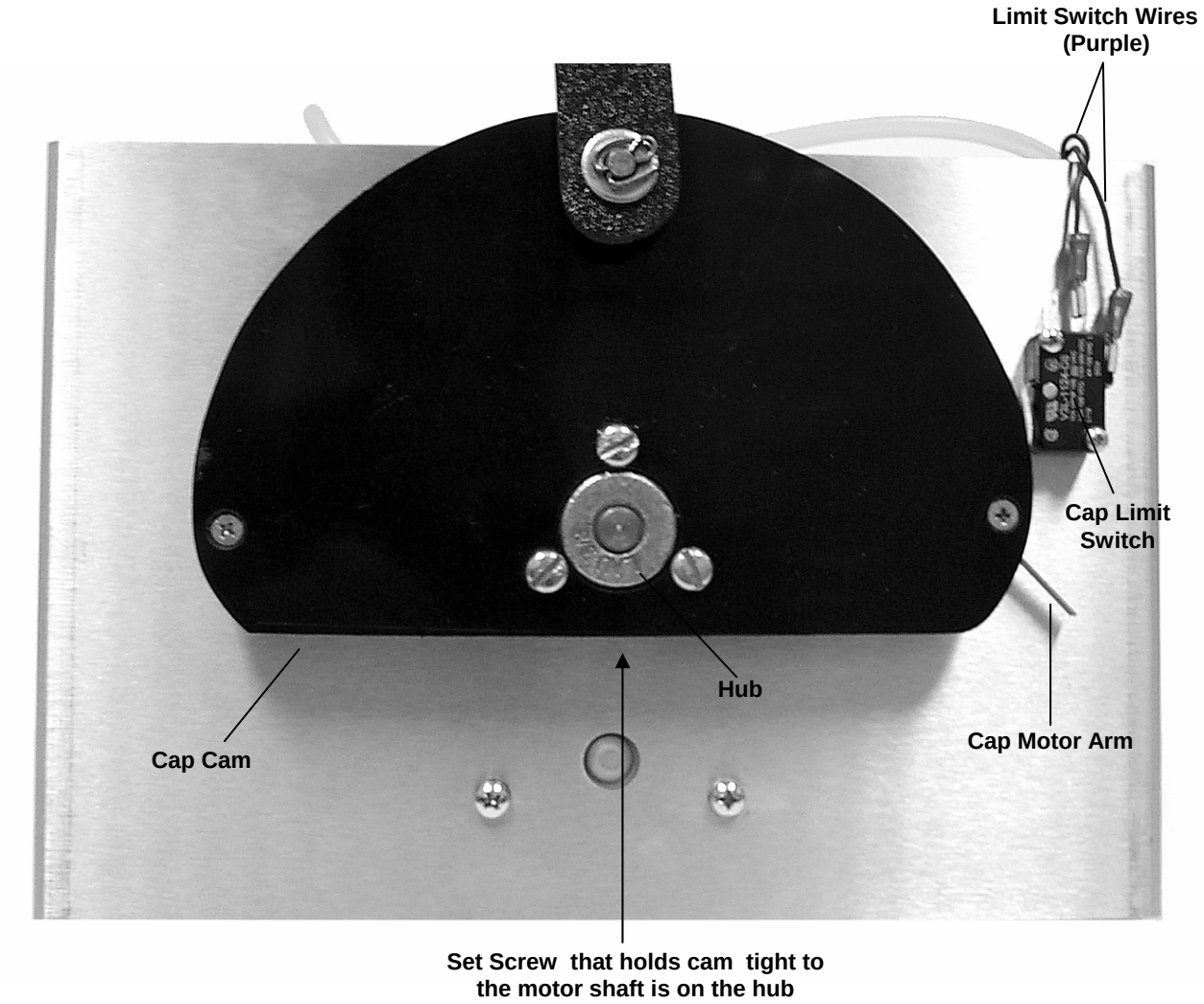


Robot Frame – Top View

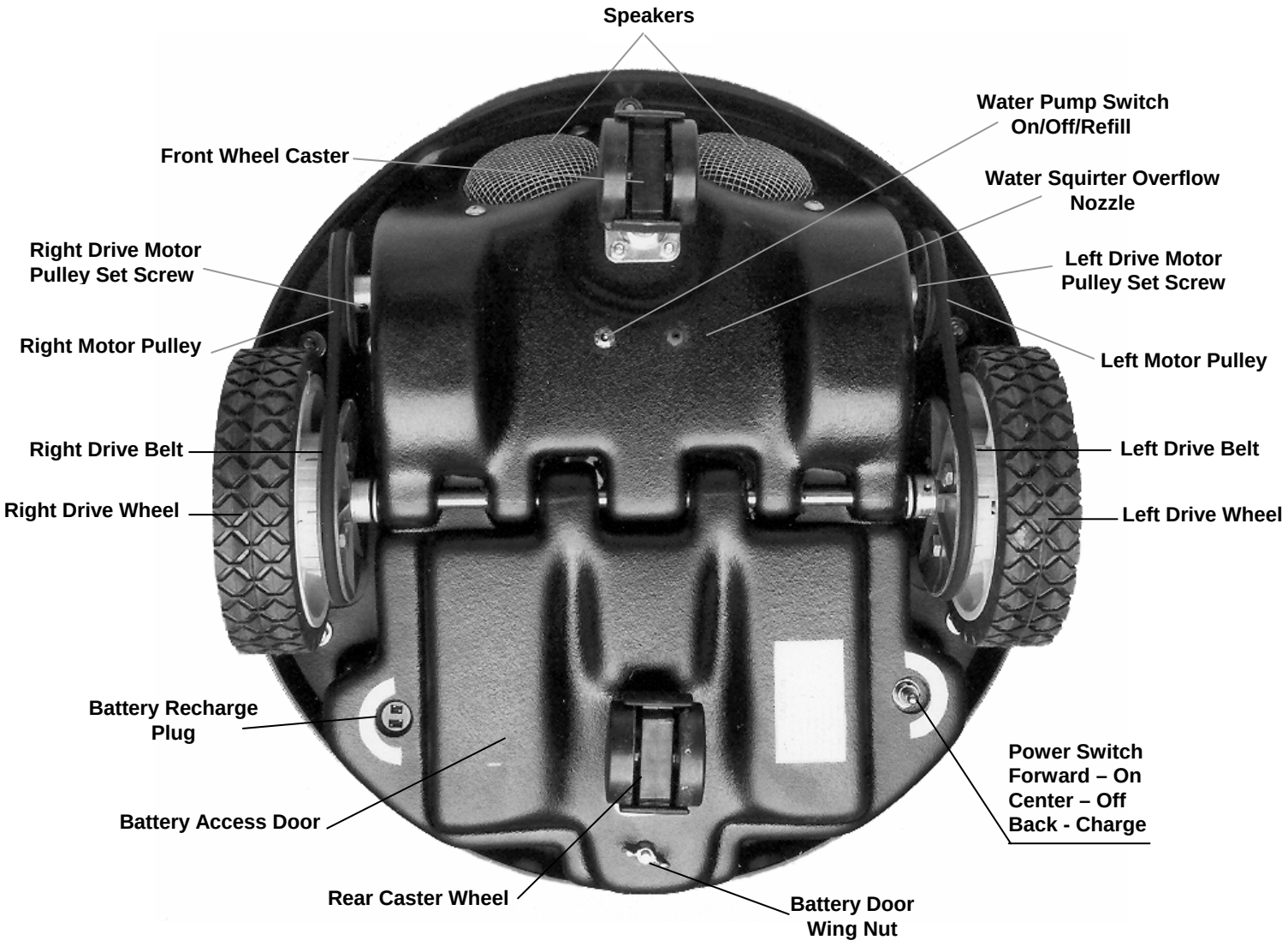
Cap Motor Assembly – Outside View



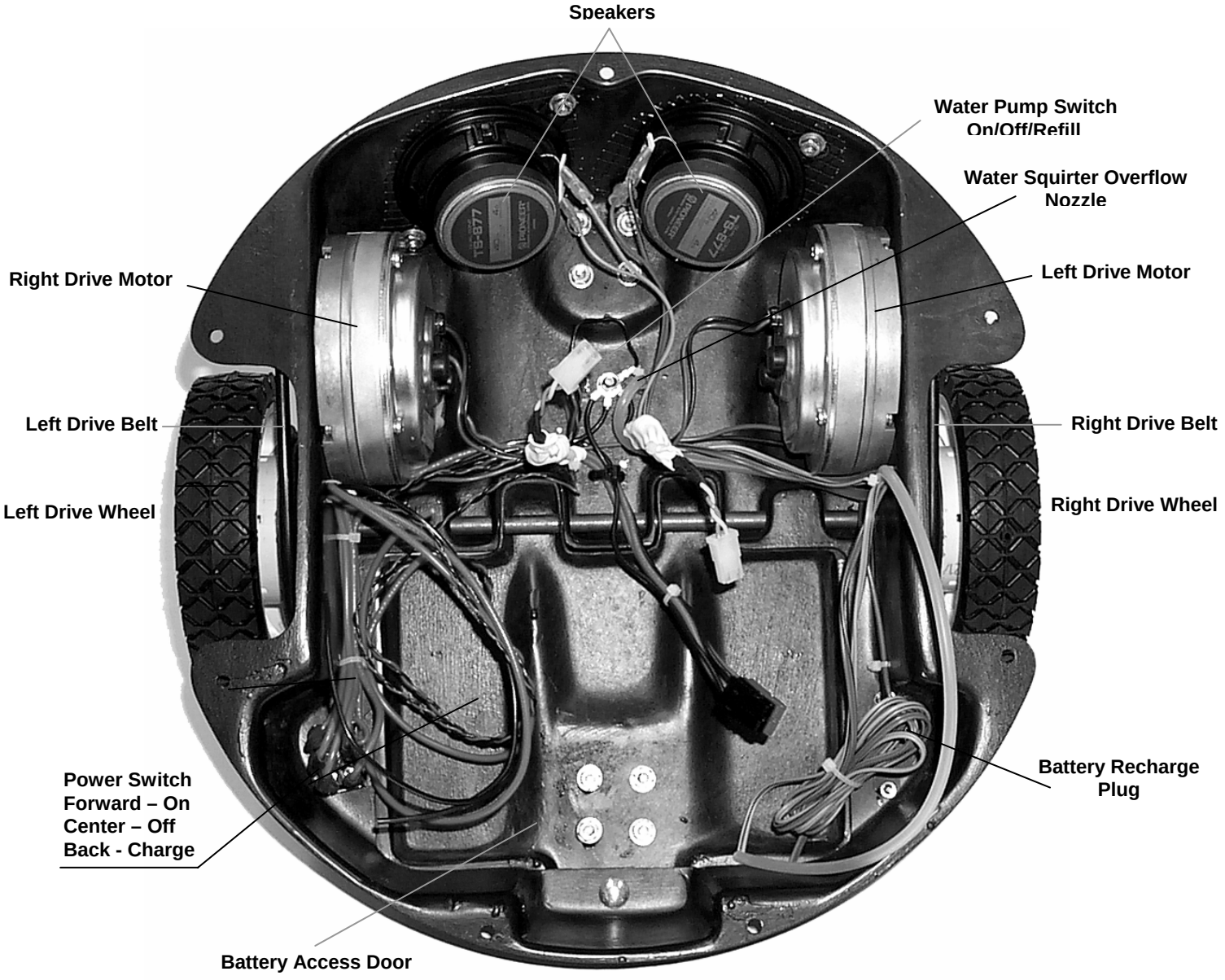
Cap Panel- Inside View



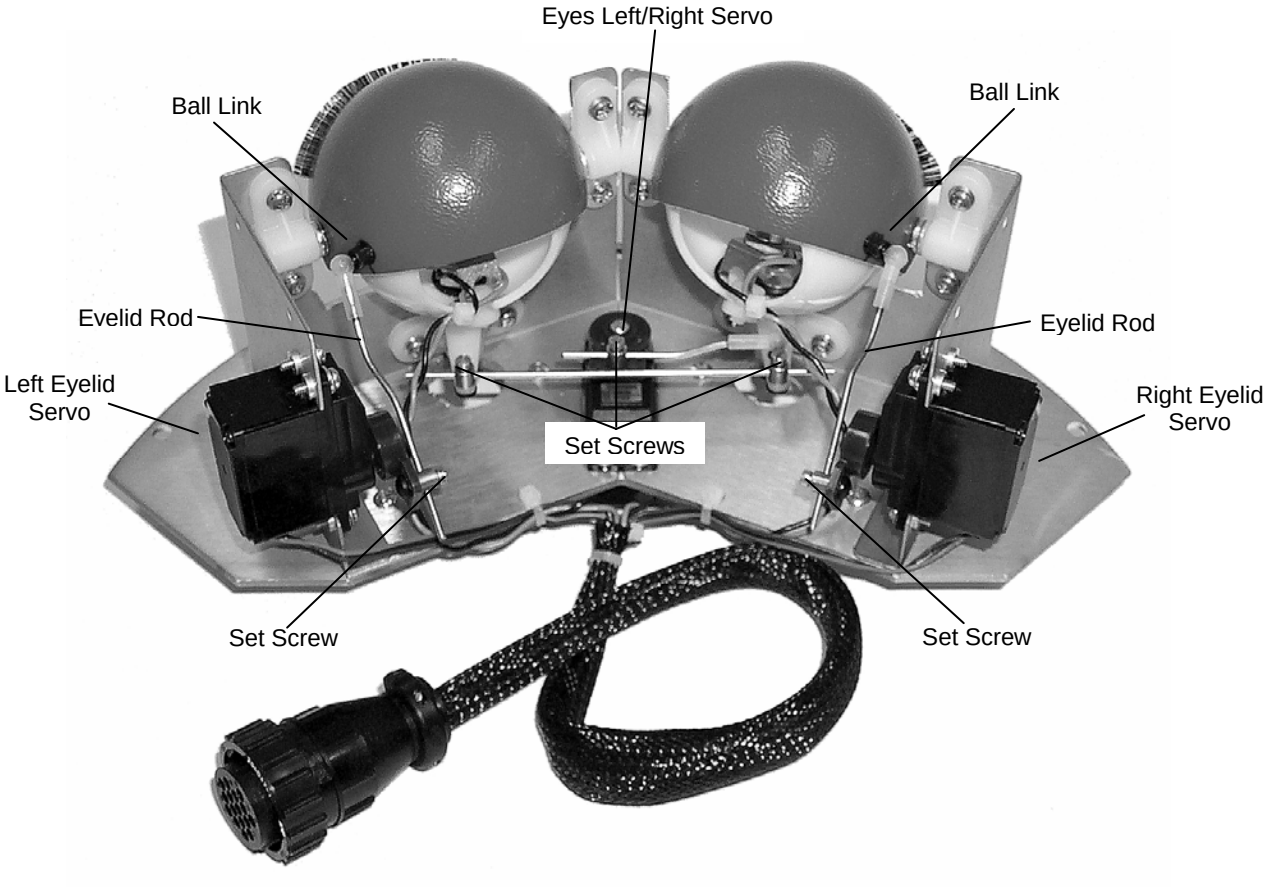
Base Frame – Bottom View

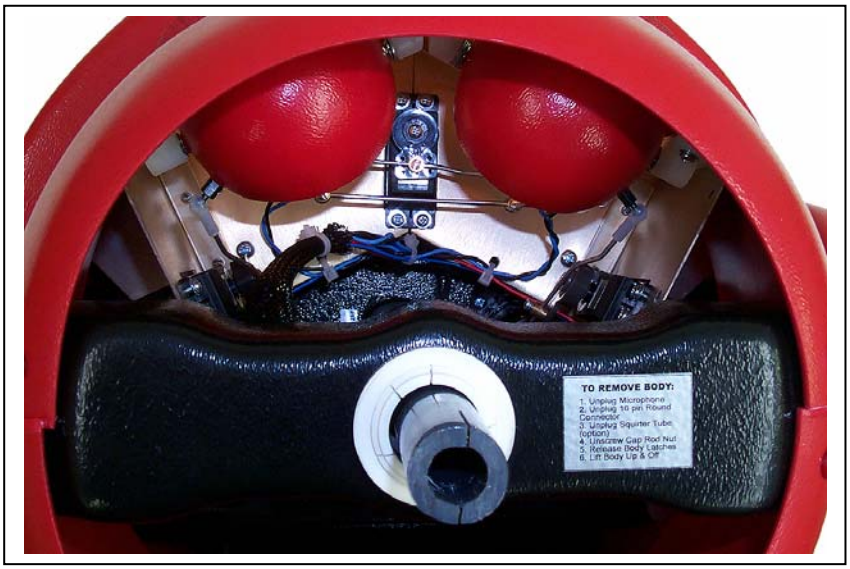


Base Frame – Inside View



Pluggie Eyes





Top View of Eyes Inside Robot

Notes

Technical Tips